

# **LAKE CHELAN FISHERY FORUM 2013 ANNUAL WORK PLAN**

**LICENSE ARTICLE 404  
SETTLEMENT AGREEMENT CHAPTER 6**

**FINAL**

**April 8, 2013**

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

## **TABLE OF CONTENTS**

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<b>SECTION 1: INTRODUCTION .....</b>	<b>1</b>
<b>SECTION 2: POTENTIAL AND PAST MONITORING AND EVALUATION MEASURES .....</b>	<b>2</b>
2.1 Comprehensive Creel Surveys .....	2
2.2 Westslope Cutthroat Trout .....	6
2.3 Kokanee .....	16
2.4 Burbot .....	18
2.5 Smallmouth and Largemouth Bass .....	18
2.6 Bull Trout.....	19
2.7 Bioenergetics Food Web Model.....	19
2.8 Tributary Barrier Confirmation and Removal Planning.....	19
<b>SECTION 3: MEASURES TO BE IMPLEMENTED IN 2013.....</b>	<b>24</b>
3.1 Fish Stocking .....	24
3.2 Monitoring and Evaluation Program .....	28
<b>LITERATURE CITED .....</b>	<b>35</b>

## ***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 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 2013 are described in Section 3.

### **2.1 Comprehensive Creel Surveys**

Comprehensive creel surveys will be conducted every three years beginning in 2010. Surveys are designed to: 1) monitor the contribution (*naturally produced or hatchery released*) of westslope cutthroat trout, rainbow trout, lake trout, kokanee, smallmouth bass and burbot to the sport fishery in the entire lake including that portion of the lake in the Lake Chelan National Recreation Area (LCNRA); and 2) determine what species of fish anglers prefer to catch.

Of particular importance is the collection of data to evaluate westslope cutthroat replacement of rainbows in the sport harvest. Equally important is annual sampling of kokanee population abundance and age composition. This information is needed to guide development of a Lake Chelan Kokanee Management Plan. 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 are available for harvest each spring. 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 Fish Hatchery, reared to fry size and released back into Lake Chelan to supplement natural kokanee production. In addition other information collected will assist with various fish management decisions.

#### ***Creel survey methods:***

To ensure results from creel surveys on Lake Chelan are useful and relevant, 2013 methods will be comparable to those used by Duke Engineering and Services (DES 2000a), Hagen 1997, and Brown 1984. The survey will conduct periodic effort counts, together with roving on-lake angler interviews every other week beginning in April and continue monthly until mid-October or monthly until determined not to be cost effective. Both effort counts and angler interviews will be on a stratified random basis. Strata should include weekdays, weekends; A.M. (0700 –1400 hours) and P.M. (1400 – 2100 hours) time periods, upper-lake (up-lake from Safety Harbor) and lower-lake (down-lake from Safety Harbor). At least two randomly chosen weekdays and one non-random weekend day, alternating between Saturday and Sunday, will be sampled every other week. Effort surveys will count and record the date and time of the survey and the number of boats observed (independently for the upper and lower portions of the lake). Angler interviews should be designed to collect information on 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 should be recorded. Stomach samples can be obtained by offering to clean anglers' fish. Stomachs should be preserved in a 10% solution of formalin for future analysis. A questionnaire designed to learn angler species preference and satisfaction can be handed out during interviews with a return mail addressed envelope. Anglers will be asked to answer the questions when they have time and return the questionnaire by mail.

**2010 Comprehensive Creel Survey Results**

During April – August of 2010 we estimated that 4,418 anglers fished for 13,786 hours and caught 6,070 total fish. The catch was comprised of 1.55% Chinook, 9.95% kokanee, 2.13% burbot, 71.80% lake trout, 2.90% rainbow trout, 0.00% cutthroat trout and 11.70% smallmouth bass. The month of May was the most productive angling period by far (Table 1).

Table 1. Estimated angler effort, harvest, release and total catch by fish species by month in Lake Chelan during April – August, 2010.

<b>Expanded Results</b>	April	May	June	July	August	Total
Total Effort (hrs)	1,303	3,912	2,604	3,363	2,604	13,786
Total Angler Trips	360	845	976	1,261	976	4,418
Chinook Harvest	11	35	10	22	15	93
Chinook Released	0	0	0	0	0	0
Chinook Catch	11	35	10	22	15	93
Kokanee Harvest	21	176	20	44	31	292
Kokanee Release	5	282	5	11	8	311
Kokanee Catch	26	458	25	55	39	603
Burbot Harvest	0	0	0	0	0	0
Burbot Released	11	71	10	22	15	129
Burbot Catch	11	71	10	22	15	129
Lake Trout Harvest	198	3,246	188	407	286	4,325
Lake Trout Released	0	35	0	0	0	35
Lake Trout Catch	198	3,281	188	407	286	4,360
Rainbow Trout Harvest	0	35	0	0	0	35
Rainbow T. Released	0	141	0	0	0	141
Rainbow Trout Catch	0	176	0	0	0	176
Cutthroat Trout Harvest	0	0	0	0	0	0
Cutthroat Trout Released	0	0	0	0	0	0
Cutthroat Trout Catch	0	0	0	0	0	0
SM Bass Harvest	0	0	0	0	0	0
SM Bass Released	59	388	56	121	85	709
SM Bass Catch	59	388	56	121	85	709
Total Fish	305	4,409	289	627	440	6,070

A comparison of the 2010 catch per species (Figure 1.) compared to, angler preference by species (Figure 2.) shows a large discrepancy between the number of lake trout caught versus the proportion of anglers that prefer to catch these fish. This is most likely a function of the number of guided fishing trips on the lake that target mostly lake trout. Unfortunately cutthroat trout made no percent of the entire catch. These findings may

be due in part to surveys only occurring in the lower portion of the lake (Wapato Basin). If at all possible, future surveys should take into account the entire lake so that more accurate detection of species encountered can be conducted.

Figure 1. 2010 catch percentages by species.

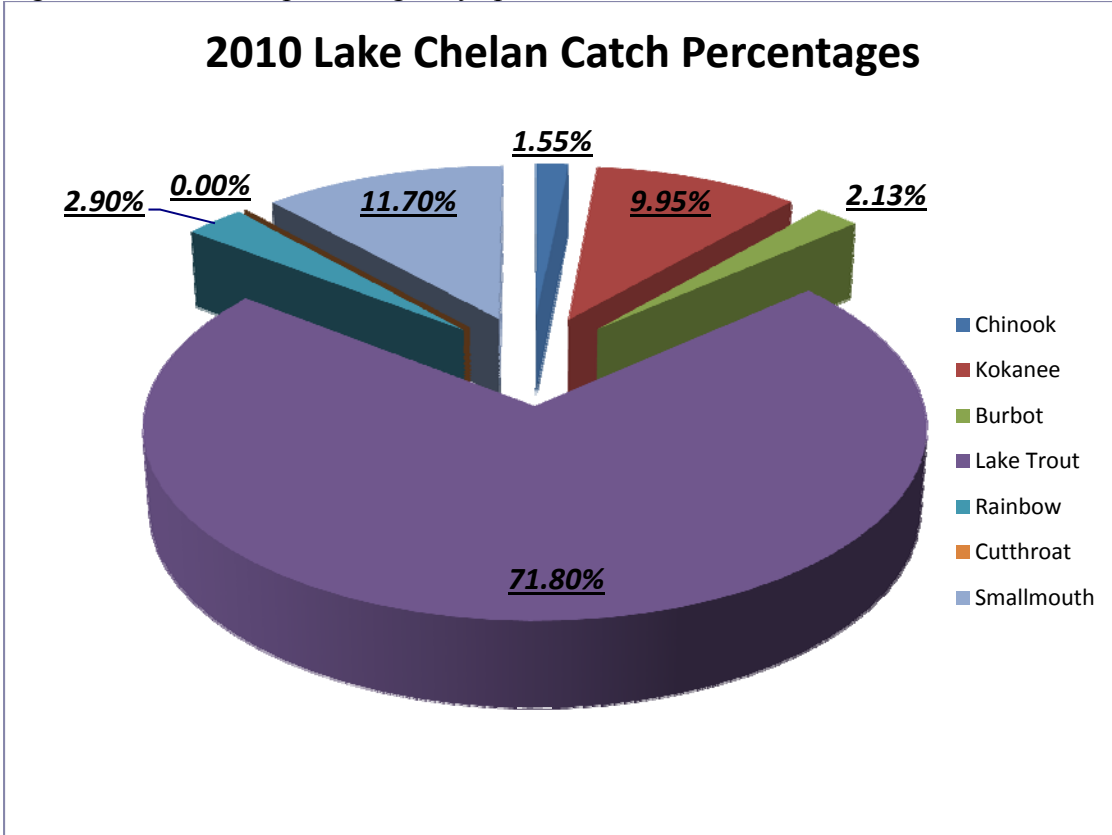
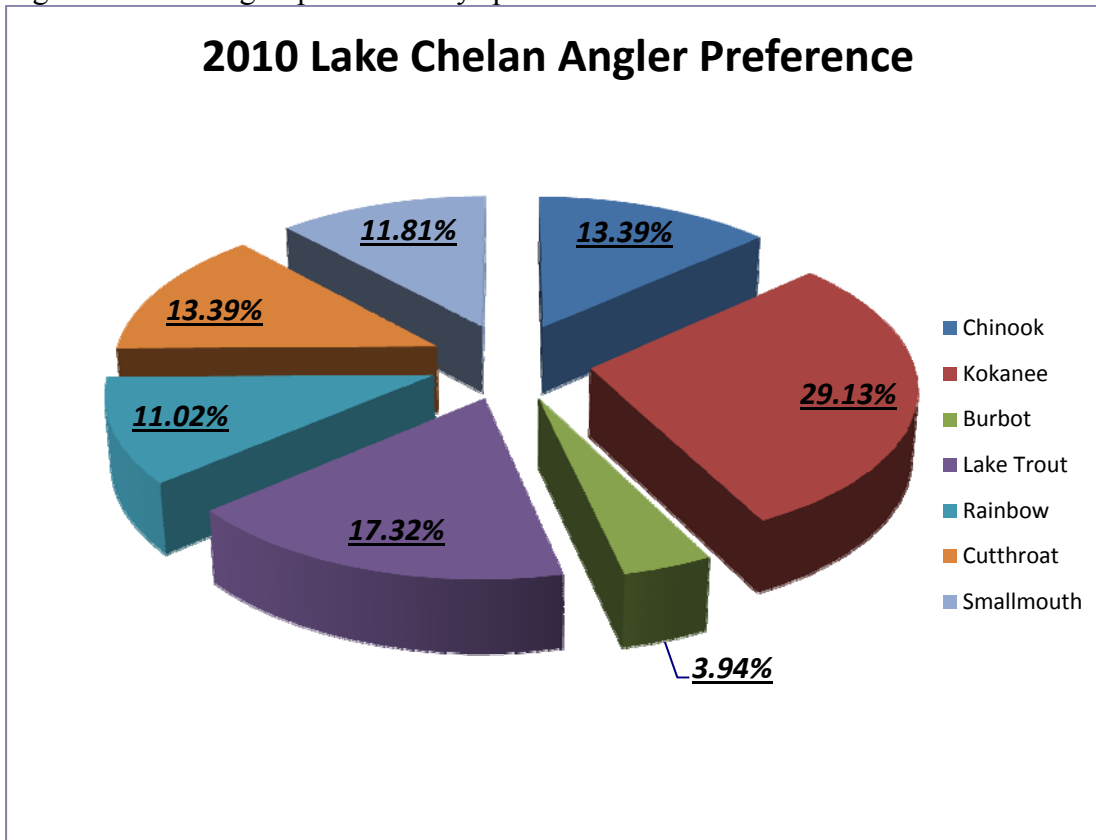


Figure 2. 2010 angler preference by species.



### 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, such as altered fishing regulations, a change in stocking practices, and removal of lake tributary alluvial barriers to spring spawning fish to accomplish this goal (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 westslope cutthroat trout (WSCT) is to increase, significantly, the abundance of WSCT 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) WSCT 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 WSCT must escape harvest and recruit to the spawning run in order to substantially increase natural production.



3) The catchable size WSCT must eventually replace the catchable size rainbow trout (RBT) in the sport fishery.

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

To determine the results of the creel survey and spring spawning surveys a database must be constructed. Data will be analyzed and evaluated to determine if our efforts are meeting the above goal and objectives.

### ***2.2.1 Lake Chelan Tributaries Spawning Monitoring and Evaluation, USFS***

Tributary westslope cutthroat trout and rainbow trout spawning monitoring will be conducted in some of the following tributaries: Bear, Big, Cascade, Four-mile, Lightning, Little Big, Riddle, Twenty-five Mile, First, Mitchell, Fish, Grade, Gold, Prince, Safety Harbor, Pyramid, Graham Harbor, Coyote, Castle, Deep Harbor and Lone Fir creeks. Powers and Tanner (2008) strongly recommended evaluation of the current status of Lake Chelan westslope cutthroat trout spawning populations prior to treatment of fish passage barriers in tributary streams. Spawning monitoring and evaluation may occur by conducting spawning ground surveys and/or snorkeling surveys.

During the spawning season (April-June) Forest Service fish biologists may perform spawning ground surveys in the adfluvial zones of selected tributaries according to the methodology of the Lake Chelan Comprehensive Management Plan (Viola and Foster 2002). Survey frequency would expect to be one survey per stream per week. Sexual maturation, the onset of spawning, and embryo development are significantly regulated by the “thermal experience” of the fish population of interest; therefore, water temperature data loggers will be deployed in survey streams starting with the first (pre-spawning) survey and remain in place until late-September. Data loggers will record water temperature every 30 minutes.

Forest Service surveyors may conduct snorkel surveys in each stream in the fall to search for young-of-the-year. Snorkelers will survey, approximately 100-meter adfluvial zone segments that contain representative habitat units (pools, tailouts, and riffles). Surveyors may attempt to capture several fish per stream by hook-and-line for sample-in-hand confirmation of species identifications by snorkelers.

**2009, 2010, 2011, and 2012 Lake Chelan Tributaries Spawning Monitoring and Evaluation Results**

Results from the 2009 Lake Chelan tributary trout spawning surveys and snorkel surveys are summarized in Tables 2 through 7. Additional summary information can be found in Lake Chelan Cutthroat Trout Spawning Ground Surveys 2009 (Johnson and Archibald 2009).

**Table 2. Cutthroat/Rainbow Trout Redds Observed in four North Shore Lake Chelan Tributaries, 2009.**

Tributary	Survey Dates							
	4/15/09	4/22/09	4/29/09	5/6/09	5/13/09	5/20/09	5/27/09	6/3/09
Mitchell Creek	0	0	0	0	0	0	No Survey	0
Gold Creek	0	0	0	0	0	0	No Survey	0
Grade Creek	0	0	0	0	0	0	No Survey	0
Safety Harbor Creek	0	0	0	0	0	0	No Survey	0
Lake Chelan Level (ft. msl)	1086	1086.2	1087	1087.8	1088.5	1089	1091.8	1094.8

**Table 3. Snorkel Survey Results for four North Shore Lake Chelan Tributaries, 2009.**

Tributary	Survey Dates	Lake Chelan level (ft. msl)	Survey Reach Length (m)	Fish Species	Length of Fish (cm)			
					<3	3-10	10-20	20-30
Gold Creek	6/25/2009	1099	150	RBT	0	11	9	1
				WSCT	0	0	3	0
Grade Creek	7/30/2009	1099.9	220	RBT	4	35	39	10
Safety Harbor Creek	7/30/2009		50	RBT	5	35	19	4
				WSCT	0	0	3	1

RBT=rainbow trout      WSCT=westslope cutthroat trout

Results from the 2010 Lake Chelan tributary trout spawning surveys and snorkel surveys are summarized in Tables 3 and 4. Additional summary information can be found in 2010 Lake Chelan Tributaries Spawning Monitoring and Evaluation (Willard 2010).

**Table 4. Cutthroat/Rainbow Trout Redds Observed in four North Shore Lake Chelan Tributaries, 2010.**

Tributary	Survey Dates							Total Redds
	4/13/10	4/20/10	4/27/10	5/5/10	5/12/10	5/19/10	5/26/10	
Mitchell Creek	0	0	0	1	0	NS	0	1
Gold Creek	0	0	0	0	0	NS	0	0
Fish Creek	0	1	1	0	0	0	0	2
Prince Creek	0	0	0	0	0	0	0	0
Lake Chelan Level(ft. msl)	1089.5	1090.0	1090.5	1091.0	1092.0	1092.0	1094.0	

<sup>a</sup>NS=No survey

**Table 5. Snorkel Survey Results for four North Shore Lake Chelan Tributaries, 2010.**

Tributary	Survey Dates	Lake Chelan level (ft. msl)	Survey Reach Length (m)	Fish <sup>a</sup> Species	Length of Fish (cm)			
					<3	3-10	10-20	>20
Mitchell Creek	9/15/2010	1,098	100	RBT	0	0	2	0
				WSCT	0	0	3	0
				KOK	0	0	0	1
Gold Creek	9/15/2010	1,098	100	RBT	0	3	1	0
				WSCT	0	3	3	0
				KOK	0	0	0	5
Fish Creek	09/29/2010	1,097	150	RBT	0	37	24	7
				WSCT	0	48	31	11
				KOK	0	0	0	36
Prince Creek	09/29/2010	1,097	100	RBT	0	0	8	5
				WSCT	0	20	5	5
				KOK	0	0	0	23

<sup>a</sup>RBT=rainbow trout; WSCT=westslope cutthroat trout; KOK=kokanee

Results from the 2011 Lake Chelan tributary trout spawning surveys and snorkel surveys are summarized in Tables 5 and 6. Additional summary information can be found in 2011 Lake Chelan Tributaries Spawning Monitoring and Evaluation (Willard 2011).

**Table 6. Cutthroat/rainbow trout redds observed in three Lake Chelan Tributaries, 2011.**

Tributary	Survey Dates			Total Redds
	4/20/11	5/04/11	5/17/11	
Fish Creek	0	0	0	0
Bear Creek	0	0	0	0
Safety Harbor Creek	0	NS <sup>a</sup>	0	0
Lake Chelan Level (ft.msl)	1084.1	1083.1	1084.8	

<sup>a</sup>NS=No survey

**Table 7. Snorkel survey results for three Lake Chelan tributaries, 2011.**

Tributary	Survey Dates	Lake Chelan level (ft. msl)	Survey Reach Length (m)	Fish <sup>a</sup> Species	Length of Fish (cm)			
					<3	3-10	10-20	>20
Fish Creek	9/15/2010	1,098	100	RBT	0	18	29	11
				WSCT	0	1	1	0
				UNK	3	0	0	0
Bear Creek <sup>b</sup>	9/15/2010	1,098	100	RBT	0	2	1	0
				WSCT	0	0	0	0
				UNK	0	0	0	0
Safety Harbor Creek	09/29/2010	1,097	150	RBT	0	7	8	9
				WSCT	0	4	4	7
				UNK	7	0	0	0

<sup>a</sup>RBT=rainbow trout; WSCT=westslope cutthroat trout; UNK=either RBT or WSCT (too small to determine); KOK=kokanee

<sup>b</sup>The water level was too high to effectively conduct a snorkel survey for Bear Creek.

The USFS decided to not continue Lake Chelan tributary spawning ground surveys in 2012 due to the challenges of logistics, timing, and efficiency. Due to the occurrence of several fires that started in September, the USFS was only able to conduct one snorkel survey in 2012. The survey was conducted on September 12<sup>th</sup> on Fish Creek, 100 meters were snorkeled and zero fish were observed.

### **2.2.2 2012 Lake Chelan Tributary Estimates of Juvenile Westslope Cutthroat and Rainbow Trout Abundance**

During 2011 WDFW sampled First, Twenty-five Mile, Mitchell, Fish, Grade, and Safety Harbor creeks to obtain information on adfluvial westslope cutthroat and rainbow trout population abundance, age class composition and other biological characteristics.

In 2012, WDFW planned to sample Gold, Prince, Fish and Railroad creeks. Also if time and personnel availability allowed, all or some of the following additional creeks may have been also sampled: Pyramid, Cascade, Big, and Four Mile.

Sampling efforts during 2012 were frustrating at best. Survey efforts were burdened by slow hiring processes, (thus the survey start date was significantly delayed), availability of crew members, insufficient equipment, weather concerns and boat breakdowns. However, we persevered and did manage to sample three of the four tributaries that were identified in the 2012 work plan (Fish, Gold and Prince creeks). We did attempt to survey Railroad creek which is considerably wider and deeper than any other tributary to the lake except the Stehekin River. Unfortunately, the block nets available to us were not of sufficient length nor were enough crew members available at the time to tackle this tributary. In 2013 we will sample Railroad, Pyramid, Cascade, Big, and Four Mile creeks. Larger and better equipment has been ordered and a more expedient hiring process is expected for 2013.

Electrofishing techniques used in 2012 were similar to those described in Brown (1984) and DES (2000a). All trout were identified as rainbow, westslope cutthroat, hybrid cutt/bows or unknown. Twenty nine young of the year trout of unknown origin were killed for genetic examination to provide some understanding of the present degree of hybridization between rainbow and westslope cutthroat trout. Genetics results are currently not available, so collected samples will be archived until funding is available to run them. Consequently, for population estimate purposes these 29 fish were arbitrarily treated as rainbows. This will provide a conservative estimate of westslope cutthroat abundance. When the genetic results become available our population estimates will be recalculated. Four of the fish sampled but not sent in for genetic examination showed obvious characteristics of westslope cutthroat x rainbow hybridization. To avoid confusion these were not included in our estimates, tables 8 and 9. Of the three creeks electrofished in 2012, Gold Creek had the highest population estimate (n=424) (Table 10).

**Table 8. Estimated 2012 Lake Chelan Tributary Rainbow Trout Species Composition, Density and Population Abundance.**

<b>Rainbow</b>						
	Site estimates		Sample site	All Rainbow per	Available <sup>2</sup> Habitat	Rainbow Population
Tributary	All RB	YOY <sup>1</sup>	Area (M <sup>2</sup> )	(M <sup>2</sup> )	Area (M <sup>2</sup> )	Estimate
Fish Creek	23 (21-24.9) <sup>3</sup>	7 (7-9.9)	165.8	0.14	2,560	356
Gold Creek	38 (38-43.4)	34 (31-41.1)	56.4	0.67	531	358
Prince Creek	25 (25-26.8)	9 (9-11.2)	143.5	0.17	1,989	347

<sup>1</sup>YOY = young of the year

<sup>2</sup>Estimated total accessible square meters of habitat in the entire stream; calculated as the minimal accessible stream length (Brown 1980) x average stream width (Viola 2012).

<sup>3</sup> (95% Confidence Interval)

**Table 9. Estimated 2012 Lake Chelan Tributary Westslope Cutthroat Trout Species Composition, Density and Population Abundance.**

<b>Cutthroat</b>						
	Site estimates		Sample site	All Cutthroat per	Available <sup>2</sup> Habitat	Cutthroat Population
Tributary	All CUTT	YOY <sup>1</sup>	Area (M <sup>2</sup> )	(M <sup>2</sup> )	Area (M <sup>2</sup> )	Estimate
Fish Creek	0 (---)	0 (---)	165.8	0	2,560	0
Gold Creek	7 (7-9.9) <sup>3</sup>	0 (6-7.7)	56.4	0.124	531	66
Prince Creek	1 (---) <sup>4</sup>	0 (---)	143.5	0.174	1,989	NA

<sup>1</sup>YOY = young of the year

<sup>2</sup>Estimated total accessible square meters of habitat in the entire stream; calculated as the minimal accessible stream length (Brown 1984) x average stream width (Viola 2012).

<sup>3</sup> (95% Confidence Interval)

<sup>4</sup>All Cutthroat caught on first pass – estimate not possible

**Table 10. Estimated 2012 Lake Chelan Tributary Total of All Rainbow & Cutthroat Trout Species Population Abundance.**

<b>Total of All Rainbow &amp; Cutthroat Trout</b>	
<b>Tributary</b>	<b>Estimate</b>
Fish Creek	356
Gold Creek	424
Prince Creek	347

Results from data gathered in 2011 and 2012 are compared to those conducted in 1982 by Brown (1984) Tables 11 and 12, respectively; the intent being to evaluate the effectiveness of recent management actions to increase WSCT abundance. Six of the eight tributaries sampled during 2011 and 2012 show an increase in the percent of cutthroat vs. the percent of cutthroat represented in 1982.

**Table 11. A comparison of species abundance and composition 1982 vs 2011.**

Tributary	1982			2011		
	All Trout	Prop. RB	Prop. CT	All Trout	%RB	%CT
First Creek	2,856	1.00	0.00	1,949	0.62	0.38
25 Mile Creek	6,144	1.00	0.00	2,580	1.00	0.00
Mitchell Creek	607	1.00	0.00	455	0.93	0.07
Grade Creek	572	1.00	0.00	292	0.80	0.20
Safety Harbor Creek	1,153	0.99	0.01	231	0.71	0.29

**Table 12. A comparison of species abundance and composition 1982 vs 2012.**

Tributary	1982			2012		
	All Trout	Prop. RB	Prop. CT	All Trout	%RB	%CT
Fish Creek	1,932	0.83	0.17	1,909	1.00	0.00
Gold Creek	4,927	1.00	0.00	5,285	0.84	0.16
Prince Creek	3,820	0.86	0.14	3,627	0.98	0.02

### **2.2.3. Stehekin River Side Channel Trout Spawning Surveys, NPS**

Spawning surveys for rainbow trout (RBT) and westslope cutthroat trout (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. The objective was to annually monitor trends in abundance of trout spawners (April 15- June 30) at 12 tributary and side channel index reaches in the lower 13km of the Stehekin River.

During 2009, initial habitat surveys (Anthony and Glesne 2010) of major side channels of the lower 13km of the Stehekin River were conducted for the purpose of selecting trout spawning index reaches. Twelve index reaches, 10 to 20 channel widths long, were selected based on presence of suitable spawning gravels and flows. Other considerations included the feasibility of conducting snorkel surveys during the May – June period of high flows and potential stability of candidate index sites for long-term monitoring. After the first year of spawning surveys (2011) one site was removed from the sample selection (index site 1) due to changes in channel morphology which reduced the suitability of this channel for trout spawning and increased the hazard associated with snorkeling this site.

Three spawning surveys were conducted in 2009, four surveys in 2010 and three in 2011. In 2009, eight RBT (>300mm), and nine RBT redds were documented. In 2010 4 RBT >300mm and zero RBT redds were documented, and in 2011 seven RBT >300mm and four RBT redds were documented. No WCT or WCT redds were documented in this three year survey effort.

Due to the absence of WCT in any of the 2009-2011 spawning surveys, the surveys were discontinued in 2012. Spring spawner surveys should be reinstated in 2015 to evaluate any improvements resulting from supplemental stocking and/or natural recruitment. In the interim period efforts to evaluate adfluvial WCT abundance and spawner documentation should be conducted as described in the following sections (2.2.4 and 2.2.5). A final summary report of 2009-2011 results (Anthony and Glesne 2012) can be found [here](#) (accessed 11/19/12).

#### **2.2.4 Stehekin River Mainstem Westslope Cutthroat and Rainbow Trout Surveys, NPS**

Despite the apparent lack of spawning WCT in Stehekin River tributary and side channel index sites (Section 2.2.3.), a number of large (380-460 mm) WCT were viewed in the mainstem Stehekin River during the autumn 2010 kokanee surveys. Though not observed while spawning, these observations confirm the presence of large, potentially adfluvial WCT in the Stehekin River system. In light of these observations in 2011 it was decided to refocus our efforts to include distribution and abundance surveys of trout during the late summer and early fall during low flow periods. The objectives of these surveys were to gain a better understanding of adfluvial WCT abundance and distribution in the Stehekin River system and for assessing progress towards restoration of these fish and evaluating management efforts directed at reduction of non-native RBT.

Eight large channel spanning pools were initially identified in the lower 7 km of the mainstem Stehekin River which were surveyed once in the early spring, and twice in the late summer/ early fall of 2011. Six of the eight pools located in 2011 were selected for continued surveys from 2012 to 2014. Pool selection was based on documented WCT presence and safety of conducting snorkel surveys within the pool. Survey methods and pool location maps were included in the 2009-2011 spawning survey report (Anthony and Glesne 2012) while a comprehensive report covering 2011-2014 mainstem pool results will be completed in the spring of 2015.

Snorkel surveys were conducted by teams of two, with one surveyor counting fish and one surveyor on the channel bank timing the snorkel pass and recording data. Fish were tallied into length groups of less than 150 mm, 150–299 mm, 300–449 mm, and  $\geq 450$  mm. Each pool was snorkeled three times and the number of fish observed by species and observation time was recorded for each pass. Results are outlined in Table 13 below.



**Table 13. Number of trout observed and size classes at six mainstem pool index sites, 2011 – 2012.**

Survey Date	# of Fish observed								
	Cutthroat			Rainbow			Eastern Brook Trout		
	150 - 299mm	300 - 449mm	≥450mm	150 - 299mm	300 - 449mm	≥450mm	150 - 299mm	300 - 449mm	≥450mm
4/27/2011	0	3	0	0	4	2	0	1	0
8/2/2011	1	1	0	5	1	0	0	0	0
8/30/2011	0	1	0	5	3	0	0	0	0
5/13/2012	2	6	0	5	3	0	0	0	0
8/20/2012	0	4	0	1	0	0	0	0	0
9/25/2012	0	7	0	0	1	0	0	0	0

In 2012, North Cascades National Park Biologists conducted exploratory snorkel surveys on two reaches of mainstem riffle habitat to assess the possibility of including this habitat in long term monitoring for WCT presence. Mainstem riffle habitat could be used in both annual monitoring of trout spawning as well as late summer fish abundance surveys. Mainstem riffle site 1 was surveyed on 8/20/2012, and consisted of a 200m reach which started at river kilometer (rkm) 6.29 and proceeded upstream to rkm 6.49. During this survey only two kokanee were observed. Mainstem riffle site 2 was surveyed on 9/25/2012, and consisted of a 200m reach beginning at rkm 5.05 to and ended at rkm 5.07. Ninety-seven kokanee were observed as well as 29 kokanee redds.

Neither of these exploratory surveys documented trout of any kind. Both surveys were conducted at low river flows; 1270cfs and 200cfs respectively. Inclusion of these mainstem riffle sites in late summer abundance surveys could be worthwhile, though mainstem surveys will be difficult to perform under flows greater than 2000cfs and thus not possible during much of the spring spawning season. If these surveys are conducted during the spring spawning period it is recommended that they be performed on the first survey date to take advantage of late winter low flow conditions.

### **2.2.5 Stehekin River Side Channel Trout Abundance Surveys, NPS**

The 2009-2011 spawning surveys failed to confirm the presence of WCT in any of the survey index reaches. As a result, subsequent fish surveys focused on documenting summer and fall abundance of WCT and RBT were implemented in 2011. Two surveys were conducted annually in side channel and tributary habitat from late July to mid-September. Visual observation and snorkeling was used to document species presence and their abundance at 11 of the 12 spawner survey index reaches. Results are outlined in Table 14 below.

**Table 14. Number of trout observed and size classes at eleven index sites, 2011 – 2012.**

Survey Date	Number of fish observed								
	Cutthroat			Rainbow			Eastern Brook Trout		
	150 - 299mm	300 - 449mm	≥450mm	150 - 299mm	300 - 449mm	≥450mm	150 - 299mm	300 - 449mm	≥450mm
7/20/2011	0	0	0	1	2	0	1	0	0
8/30/2011	0	8	0	22	0	0	15	0	0
8/20/2012	0	1	0	0	0	0	0	0	0
9/25/2012	0	8	0	0	4	0	10	0	0

An additional sampling effort was made in 2011 and 2012 to collect young-of-year fish for genetic analysis to provide definitive species information about successful trout spawning in four index reaches. Species composition of these samples is useful for determining RBT and WCT spawner use of the index reaches, and if hybridization was occurring. A sample of 25 fry was collected from each of the four index reaches in 2011, and four additional sites in 2012. Results from the 2011 sampling effort indicated that none of the newly emerged fry were WCT, and hybridization rates ranged from 0% to 36% in the four channels surveyed. All non-hybridized fish were determined to be rainbow trout. Genetic analyses of 2012 samples are currently being conducted by Carl Ostberg (USGS Western Fisheries Research Center) following methods in Ostberg and Rodriguez (2006) and results will be available in March, 2013.

#### ***2.2.6 Monitor Frequency of Non-Native Rainbow Trout Genetic Introgression in Native Westslope Cutthroat Trout in the Stehekin River, NPS***

During 2010, fish tissue samples were collected at seven Stehekin River locations distributed throughout the drainage to monitor the level and frequency of hybridization between non-native RBT and native WCT. Sites were selected to represent the gradient of introgression ranging from pure WCT to a mixture of pure fish, F1 and post-F1 hybrids to mostly pure RBT as previously documented in the Ostberg and Rodriguez 2006 publication.

Laboratory analyses have been completed (USGS-WFRC, Seattle) and full results of the 2010 sampling effort (Ostberg and Chase 2012) are available [here](#) (accessed 12/2/2012). Results indicate that there has not been any significant change in the frequency of WCT, RBT, and hybrids between the two time periods at any of the locations sampled. It is recommended that we continue to monitor genetic introgression every five to ten years to evaluate the status and progress towards WCT restoration in the watershed.

### **2.3 Kokanee**

Kokanee are the most sought after fish in Lake Chelan (Brown 1984; DES 2000a). Maintaining a popular kokanee sport fishery in Lake Chelan is a high priority; to achieve a successful kokanee sport fishery, kokanee should be managed to maintain their abundance at a mean size acceptable to anglers, but at a level of abundance that does not substantially hinder efforts to restore native species.

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 Fall Index Stream Kokanee Spawning Surveys, CPUD***

Chelan PUD has conducted annual Lake Chelan spawning ground 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). Two tributaries of the Stehekin River, Company Creek and Blackberry Creek, have been used as index reaches since 1984 because a majority of kokanee production from the Stehekin originates from in these tributaries. 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.

Surveys have been conducted approximately twice monthly between August 31 and October 30. However, sampling methodology was altered as described in Section 3.3.7 in 2012 due to availability of survey crews. Crews conduct surveys by walking in or along the streams and counting all live kokanee. Tally counters are used to keep track of fish numbers. Large masses of kokanee are estimated in some pools located in Company and Blackberry creeks (Stone and Fielder 2004).

The LCFF has requested that Chelan PUD continue to conduct these annual kokanee spawning grounds surveys beginning in the fall of 2007. Chelan PUD will continue to conduct these surveys to maintain sampling method continuity and comparability in the long record of estimated kokanee escapement that has been established through the past license term.

Results of kokanee spawning ground surveys can be found at the following link that will navigate to the Chelan PUD Lake Chelan License Implementation webpage under Projects, Monitoring and Evaluation Activities: <http://www.chelanpud.org/lc-Resource-Documents-LCFF.cfm>

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

Kokanee spawning surveys conducted during the previous license focused on a set of important subjectively selected index reaches of tributaries to Lake Chelan and the Stehekin River (Fielder 2000; Stone and Fielder 2004). The continuity of this important long-term survey has been maintained in the new license period (Section 2.3.1). However, there is significant kokanee production emanating from the mainstem and side channel habitat of the Stehekin River that is not being assessed using current survey methods (DES 2000b). An expanded kokanee survey, including a probability sample of all potential kokanee spawning habitat in the mainstem, side channels, and tributaries, was completed in 2010. The intent of the survey was to develop a better estimate of the

total escapement of kokanee spawners in the Stehekin River and to track changes in distribution of spawners in the watershed.

In the spring of 2010 North Cascades National Park Service (NOCA) personnel conducted habitat surveys on all fish accessible side channels in the lower 16km of the Stehekin River. These surveys were based on Forest Service Level 2 habitat surveys with additional criteria for defining suitable kokanee spawning habitat. A total of 9.60 km were deemed suitable for kokanee spawning based on substrate data and channel depths. Of this 9.60 km of suitable habitat, 3.40 km were randomly selected as kokanee spawning survey reaches. Additionally, the mainstem Stehekin River was partitioned into thirty-two 500m reaches. Of these 500m reaches, 8 were considered poor kokanee habitat as the river channel is deeply incised and substrate consists of large cobbles and boulders. These reaches were identified in a 2007 NOCA large woody debris survey as “transport zones”. Of the remaining 24 reaches, 12 were randomly selected for sampling. All randomly selected mainstem and side channel reaches were sampled four times (two week intervals) between August 30<sup>th</sup> and October 15<sup>th</sup>.

Extrapolation of spawner survey counts to all suitable mainstem and all suitable side channel habitat was determined using the Area Under the Curve Method (Beidler and Nickelson 1980). Preliminary results show a total of 50,580 kokanee using the mainstem Stehekin channel and 131,568 kokanee using the side channel habitat. Total kokanee escapement was estimated at 182,148 fish. A detailed report incorporating the 2010 results and the results from the 2000 expanded kokanee side channel spawner survey is currently in preparation.

Replication of this survey is recommended at five year intervals, with the next survey in 2015. Results will be used to calibrate annual Chelan PUD index reach escapement to total escapement and to evaluate changes in habitat and spawner 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.

### **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.

### **2.7 Bioenergetics Food Web Model**

Funding for the LCFF bioenergetics food web model was provided by Chelan PUD funding (\$115,000) and the NPS (\$235,000). The bioenergetics food web model report is complete and has been posted on the Lake Chelan Implementation website ([http://www.chelanpud.org/departments/licensingCompliance/lc\\_implementation/ResourceDocuments/34039.pdf](http://www.chelanpud.org/departments/licensingCompliance/lc_implementation/ResourceDocuments/34039.pdf)). The LCFF may choose to fund additional work related to the food web model in future years using funds dedicated to implementing the Monitoring and Evaluation program.

### **2.8 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 uplake 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 bedload 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 westslope cutthroat trout restoration program additional time to increase tributary WSCT 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 2009 included the following:

1. A photographic reconnaissance of the main tributaries in February 2009. The new lake level operating regime for the Lake Chelan Project has been in effect since September 2007. The intent of the new regime was to draft the lake lower in the fall in order to allow winter freshets to carve out sediment at the mouths of tributaries to prevent formation of barriers (depth, velocity, gradient) to upstream adult fish passage, primarily westslope cutthroat trout, in the spring for spawning. Changes in tributary mouths were noted, particularly at Fish, Prince, and Safety Harbor Creeks. Obvious barriers to upstream passage were documented in March 2008. These barriers appear to have been removed in Fish, Prince and Safety Harbor Creeks by freshets that occurred during the winter of 2008-2009. Other tributaries appear also to be “healing themselves,” with better fish passage conditions documented in the February 2009 photographs. A storm event occurred the first week in January 2009 that raised the discharge from the Stehekin River significantly. It is expected that the tributaries to the lake followed a similar pattern. This event, and preceding ones during winter 2008-2009, may be responsible for the changes noted in the 2009 photographs. These data are preliminary, but give an indication that the new lake level operating regime may be providing the desired benefits of preventing tributary mouth barrier formation and removing existing barriers to upstream adult fish passage.
2. As planned, a site visit was conducted on April 2, 2009 when the lake surface elevation was approximately 1,086 feet relative to mean sea level, near the annual low operating level and when the stream discharge was low. Attending were members of the Fisheries Forum with consultant team members Chris Fairbanks, fisheries biologist, Craig Cooper, fluvial geomorphologist, and Pat Powers, fisheries engineer. The objectives of the site visit were to make a qualitative determination of the extent and nature of upstream fish passage barriers at each of the four creeks and to explore alternatives for enhancing or creating upstream fish passage. The four tributaries included: Mitchell, Gold, Grade, and Safety Harbor creeks. Excerpts from field notes (complete field notes and photos can be viewed at [www.chelanpud.org/lc-Resource-Documents-LCFF.cfm](http://www.chelanpud.org/lc-Resource-Documents-LCFF.cfm)

**Mitchell Creek** - The field team consensus was that upstream fish passage was impeded primarily by shallow water depth. A solution to improve upstream passage was to confine the stream flow to a narrower channel that would provide depth with some step-pools to allow resting stations. Large angular rocks would be the most appropriate materials that would be most resistant to movement by high stream flows or by campground guests. Large woody material would not be an appropriate material.

**Gold Creek** - The Gold Creek channel has been very stable since the 2000 field season. The creek has remained confined to a channel that extends from the full pool level through the alluvial fan to the lake surface. Large rocks along the right bank (looking downstream) keep the stream channel confined. The overall grade of the stream channel in the alluvial fan was 10% with a short cascade of 16.7%. The group consensus was that fish passage was impeded by grade and water

velocity that could be improved with rock weirs. Rock weirs would create step pools which would reduce the overall grade and water velocity. The step pools would also provide resting stations for upstream migrating fish. Additional parameters that were discussed to reach consensus include: tributaries should be passable above lake elevation of 1,086 feet to ensure upstream passage for spring spawners; design criteria should target 8-10 inch westslope cutthroat and rainbow trout.

**Grade Creek** - A challenging site. The overall grade of the stream channel in the alluvial fan was 19% with few step pools for resting stations for upstream migrating fish. The channel appears to be fairly similar to the 2000 field season (and 2008 photos). The team consensus was that fish passage was impeded by the steep slope and by high water velocity with few resting stations for upstream migrating fish. Several ideas to lengthen the stream channel were discussed. However, physical constraints of the site's geology and stream energy make alterations of the stream channel unfeasible. Placement of prefabricated fishways was considered as a method to provide upstream passage. The fishways would be costly to construct and would need frequent monitoring and servicing to ensure that rock and woody material is not blocking fish passage. At a subsequent LCFF meeting, USFS Fish Biologist Phil Archibald recommended in 2009 that enhanced upstream passage in Grade Creek be assigned a very low priority for the previously noted reasons in addition to limited adfluvial habitat that could be made accessible (220 m) and the presence of only rainbow trout (no cutthroat) in the creek.

**Safety Harbor Creek** - The stream channel of Safety Harbor Creek has been greatly down-cut compared to the 1999 and 2000 field seasons and 2008 photos. The grade, water velocity, and water depth appear to be appropriate for upstream fish passage. The group consensus was that fish passage was unimpeded except for temporary obstacles presented by floating woody material that has accumulated near the full pool level. Group members removed several key pieces to allow natural processes to keep a section of the channel clear of debris and with adequate water. By the end of July 2009, most of the wood had been flushed from the mouth of the creek.

3. Initial designs for barrier removal were submitted to CPUD by the consultant team on 6/26/2009 and reviewed and discussed by the LCFF on 7/14/2009. The LCFF reached consensus on proceeding with modified designs for Mitchell and Gold Creeks. Final designs were submitted to CPUD on 8/20/2009 and agreed to by the LCFF.
4. Chelan PUD initiated acquisition of all required permits and contract bid package to conduct barrier removal and stream mouth restoration projects in Mitchell and Gold Creeks in 2011.



Efforts to implement barrier removal in Lake Chelan tributaries in 2010 included the following:

1. Permit packages for both Mitchell and Gold creeks were submitted by Chelan PUD to the U.S. Army Corps of Engineers (COE), approved by the COE, and received by Chelan PUD, allowing for proceeding with barrier removal and stream channel restoration activities in 2011.
2. A construction contractor (Rayfield Construction) was secured by Chelan PUD to conduct work at both Mitchell and Gold creeks.

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 2012 included photo-documentation of existing conditions at the mouths of First, Twenty-five Mile, Gold, Mitchell, Safety Harbor, Fish, Prince, and Railroad creeks in March during lake drawdown. Mechanical treatment was employed at Gold and Mitchell creeks. Monitoring trips verified that connectivity was maintained in all creeks surveyed. Photographs of tributary mouths can be found at the following link of the Lake Chelan Implementation webpage under Projects, Tributary Barriers. <http://www.chelanpud.org/lc-Resource-Documents-LCFF.cfm>

**SECTION 3: MEASURES TO BE IMPLEMENTED IN 2013**

The following addresses Tributary Barriers, Fish Stocking, and the Monitoring and Evaluation Program measures that will be implemented in 2013.

**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 westslope cutthroat trout (WSCT) and triploid rainbow trout (RBT)).

The stocking plan from WDFW for 2010 is shown in Table 15 (Art Viola, WDFW, pers. com.). The actual number of fish released by WDFW into Lake Chelan in 2010 is presented in Table 16 (Corey Morrison, WDFW, pers. com.).

**Table 15. 2010 Fish Stocking Plan**

Location	Species	Stock	Number	No. Fish/lb	Stocking date
<b>Lake Chelan Tributaries</b>					
Four Mile Creek	Cutthroat	Twin LK	10,000	Eyed eggs	June
Cascade Creek	Cutthroat	Twin LK	5,000	Fry	June or July
Bear Creek	Cutthroat	Twin LK	3,000	Fry	June or July
Big Creek	Cutthroat	Twin LK	2,000	Fry	June or July
<b>Lake Chelan</b>					
	Cutthroat	Twin LK	50,000	15	March
		ad clipped	(80%)		
	Kokanee	Lake Chelan	80,000	80	Mid May
	Triploid Rainbows	Spokane	50,000	3	August-September
<b>Mill Creek</b>					
	Cutthroat	Twin LK	3,000	Fry	June or July
	Triploid Chinook <sup>1</sup>	summer	50,000	Fry	March

1– The triploid Chinook program is not funded by Chelan PUD

**Table 16. 2010 Actual Fish Stocking**

Location	Species	Stock	Number	No. Fish/lb	Stocking date
<b>Lake Chelan Tributaries</b>					
Four Mile Creek	Cutthroat	Twin LK			
Cascade Creek	Cutthroat	Twin LK	5,000	Fry	June or July
Bear Creek	Cutthroat	Twin LK	3,000	Fry	June or July
Big Creek	Cutthroat	Twin LK	2,000	Fry	June or July
<b>Lake Chelan</b>	Cutthroat	Twin LK	52,180	5.6	June-July
		ad clipped	(80%)		
	Kokanee	Lake Chelan	89,119	64	May 5 <sup>th</sup> - 6 <sup>th</sup>
	Triploid Rainbows	Spokane	555	0.36	May - September
	Triploid Rainbows	Spokane	19,545	3	August-September
<b>Mill Creek</b>	Cutthroat	Twin LK	3,000	Fry	June or July
	Triploid Chinook <sup>1</sup>	summer	42,000	100	March

1– The triploid Chinook program is not funded by Chelan PUD

The stocking plan from WDFW for 2011 is shown in Table 17 below (Corey Morrison, WDFW, pers. com.). The actual number of fish released by WDFW into Lake Chelan in 2011 is presented in Table 18 (Corey Morrison, WDFW, pers. com.).

**Table 17. 2011 Fish Stocking Plan**

Location	Species	Stock	Number	No. Fish/lb	Stocking date
<b>Lake Chelan Tributaries</b>					
Four Mile Creek	Cutthroat	Twin LK	10,000	Eyed eggs	June
Cascade Creek	Cutthroat	Twin LK	5,000	Fry	June or July
Bear Creek	Cutthroat	Twin LK	3,000	Fry	June or July
Big Creek	Cutthroat	Twin LK	2,000	Fry	June or July
<b>Lake Chelan</b>	Cutthroat	Twin LK	100,000	15	March
		ad clipped	(80%)		
	Kokanee	Lake Chelan	80,000	80	Mid-May
	Triploid Rainbows	Spokane	1,000	0.4	May - September
	Triploid Rainbows	Spokane	50,000	2.5	August-September
<b>Mill Creek</b>	Cutthroat	Twin LK	3,000	Fry	June or July
	Triploid Chinook <sup>1</sup>	summer	50,000	100	March

1– The triploid Chinook program is not funded by Chelan PUD

**Table 18. 2011 Actual Fish Stocking**

Location	Species	Stock	Number	No. Fish/lb	Stocking date
<b>Lake Chelan Tributaries</b>					
First Creek	Cutthroat	Twin LK	26,899	Fry	Early September
<b>Lake Chelan</b>					
	Cutthroat	Twin LK	137,224	Fry	Late September
		Twin LK	51,949	15	April
		ad clipped	(80%)		
	Kokanee	Lake Chelan	0	N/A	N/A
	Triploid Rainbow	Spokane	1,686	0.4	May - September
	Triploid Rainbow	Spokane	46,829	3.4	August - September
	Triploid Chinook <sup>1</sup>	Summer	22,000	100	March

1– The triploid Chinook salmon program is not funded by Chelan PUD

The stocking plan from WDFW for 2012 is shown in Table 19 below (Travis Maitland, WDFW, pers. com.). The actual number of fish released by WDFW into Lake Chelan in 2012 is presented in Table 20 (Corey Morrison, WDFW, pers. com.).

**Table 19. 2012 Fish Stocking Plan**

Location	Species	Stock	Number	No. Fish/lb	Stocking Date
<b>Lake Chelan Tributaries</b>					
Twenty Five Mile Creek	Cutthroat	Twin LK	29,091	Fry	June or July
First Creek	Cutthroat	Twin LK	14,545	Fry	June or July
Grade Creek	Cutthroat	Twin LK	3,636	Fry	June or July
Safety Harbor Creek	Cutthroat	Twin LK	2,727	Fry	June or July
Company Creek	Cutthroat	Twin LK	78,750	Fry	June or July
Blackberry Creek	Cutthroat	Twin LK	81,900	Fry	June or July
<b>Lake Chelan</b>					
	Cutthroat	Twin LK	50,000	15	March
		ad clipped (80%)			
	Kokanee	Lake Chelan	80,000	80	Mid May
	Triploid Rainbow	Spokane	1,000	0.5	May - September
	Triploid Rainbow	Spokane	50,000	2.5	August - September
<b>Mill Creek</b>					
	Cutthroat	Twin LK	3,000	Fry	June or July
	Triploid Chinook <sup>1</sup>	summer	50,000	100	March

1– The triploid Chinook program is not funded by Chelan PUD

**Table 20. 2012 Actual Fish Stocking**

Location	Species	Stock	Number	No. Fish/lb	Stocking Date
<b>Lake Chelan Tributaries</b>					
Twenty Five Mile Creek	Cutthroat	Twin LK	29,000	Fry	August
Twenty Five Mile Creek	Cutthroat	Twin LK	7,803	10	June
First Creek	Cutthroat	Twin LK	15,000	Fry	August
Grade Creek	Cutthroat	Twin LK	3,000	Fry	September
Safety Harbor Creek	Cutthroat	Twin LK	3,500	Fry	September
Company Creek	Cutthroat	Twin LK	17,500	Fry	September
Blackberry Creek	Cutthroat	Twin LK	0	Fry	
<b>Lake Chelan</b>	Cutthroat	Twin LK	72,980	15	April
		ad clipped (80%)			
	Cutthroat	Twin LK	1,000	Fry	September
	Kokanee	Lake Chelan	27,200	100	Mid May
	Triploid Rainbow	Spokane	1,898	0.8	October
	Triploid Rainbow	Spokane	39,339	2.5	August - September
<b>Mill Creek</b>	Triploid Chinook <sup>1</sup>	summer	38,940	100	March

1– The triploid Chinook program is not funded by Chelan PUD

In 2013, WDFW will release approximately 15,000 WSCT (at a size of 15 fish/pound) at Lakeside and Mill Bay in March. This reduction in stocking numbers from that of previous years is a direct result of a bacterial pathogen (Furunculosis) infecting this stock and causing high mortality rates at Chelan Hatchery during the fall of 2012. Approximately 50,000 triploid rainbow trout (at a size of 3 fish/pound) will be released at Lakeside in August and September (Travis Maitland, WDFW, pers. com.). Kokanee broodstock were not collected in 2012, therefore juvenile kokanee stocking will not occur in 2013. Additionally, approximately 125,000 WSCT fry will be released into various lake tributaries (at a size of 400-600 fish/lb.) in July and August (Table 21) (Travis Maitland, WDFW, pers. com.).

**Table 21. 2013 Fish Stocking Plan**

Location	Species	Stock	Number	No. Fish/lb	Stocking Date
<b>Lake Chelan Tributaries</b>					
Twenty Five Mile Creek	Cutthroat	Twin LK	29,000	Fry	June – August
First Creek	Cutthroat	Twin LK	14,700	Fry	June – August
Grade Creek	Cutthroat	Twin LK	2,700	Fry	June – August
Safety Harbor Creek	Cutthroat	Twin LK	3,200	Fry	June – August
Mitchell Creek	Cutthroat	Twin LK	4,000	Fry	June – August
Fish Creek	Cutthroat	Twin LK	6,000	Fry	June – August
Gold Creek	Cutthroat	Twin LK	1,200	Fry	June – August
Prince Creek	Cutthroat	Twin LK	4,700	Fry	June – August
Company Creek	Cutthroat	Twin LK	30,000	Fry	June – August
Blackberry Creek	Cutthroat	Twin LK	30,000	Fry	June – August
<b>Lake Chelan</b>	Cutthroat	Twin LK	15,000	15	March
		Ad-clipped (80%)			
	Kokanee	Lake Chelan	0		
	Triploid Rainbow	Spokane	1,000	0.5	May - September
	Triploid Rainbow	Spokane	50,000	2.5	August - September
<b>Mill Creek</b>	Triploid Chinook <sup>1</sup>	summer	50,000	100	March

1– The triploid Chinook program is not funded by Chelan PUD

### 3.2 Monitoring and Evaluation Program

#### **3.2.1 Comprehensive Creel Surveys, WDFW**

Comprehensive creel surveys began in 2010 and will be completed every third year after the initial survey year; therefore WDFW will conduct a creel survey in 2013. WDFW will conduct surveys throughout the entire lake in an effort to capture a more accurate accounting of the actual catch potentially produced by the lake.

#### **Estimated Budget and Schedule:**

Year	Task	Total \$	Requested \$ (LC06b1)	Requested CCPUD Matching \$ (LC06b2)	WDFW Matching \$
2013	Conduct a comprehensive Creel survey every other week April 1 – October 15 Two Scientific technicians for 3 days/week x 14 weeks = 84 man days.	\$20,788		\$10,394	\$10,394
2013	Data Mtg. and Reporting.	\$2090		\$1,045	\$1,045
2013	Boat and Vehicle Operating Costs.	\$7,702	\$7,702		
2013	Fish age/origin determination	\$1,284		\$642	\$642
2013	Supplies and Equipment	\$386	\$386		
	<b>2013 Estimated Totals</b>	\$32,250	\$8,088	\$12,081	\$12,081

**3.2.2 2013 Lake Chelan Tributaries Spawning Monitoring and Evaluation, USFS**

In the spring, (April-June) Forest Service personnel will install thermographs in six tributaries to predict fry emergence of spring spawning westslope cutthroat trout and rainbow trout. In the fall (September), Forest Service personnel will conduct snorkel surveys in these six tributaries to document the presence/absence of rainbow trout and westslope cutthroat trout young-of-year. The snorkel survey data will also be combined with the WDFW electrofishing data to obtain a more robust population estimate for selected tributaries. Specific tributaries in which the monitoring will be conducted will be determined and coordinated with WDFW activities (i.e., fish stocking and abundance estimates). Additionally, Forest Service personnel will periodically monitor the mechanical treatment of the outlets of Gold and Mitchell creeks (completed in March 2011).

**Estimated USFS Budget and Schedule:**

<b>Year</b>	<b>Task</b>	<b>Total \$</b>	<b>Requested \$ (LC06b1)</b>	<b>Requested PUD Matching \$ (LC06b2)</b>	<b>USFS Matching \$</b>
2013 April	Install temperature data loggers (GS11 fisheries biologist)	\$360		\$180	\$180
July-August	Conduct snorkel surveys in 6 adfluvial tributary zones. (GS5 & GS11 Fish Bios for total of 6 crew-days)	\$3,640		\$1,820	\$1,820
April-August	USFS boat fuel	\$1,000	\$1,000		
April-August	USFS boat driver	\$2,380		\$1,190	\$1,190
Nov-Dec	Data Mgt. and Reporting (GS11 Fish Bio. for 5 person-days)	\$1,410		\$705	\$705
<b>2013 Estimated Totals</b>		<b>\$8,790</b>	<b>\$1,000</b>	<b>\$3,895</b>	<b>\$3,895</b>

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

Tasks associated with collecting data to provide estimates related to species abundance and composition for lake tributaries began in 2011. WDFW has planned to sample First, Twenty-five Mile, Railroad, Mitchell, Fish, Grade, Gold, Prince, and Safety Harbor Creeks to obtain information on adfluvial WSCT and RBT population abundance, age class composition and other biological characteristics. Each of these tributaries will be subject to these tasks every third year after the initial survey year. If time and personnel availability allow, all or some of the following additional creeks may also be sampled on a three year rotation: Pyramid, Cascade, Big, and Four Mile Creeks. In 2013 WDFW will sample Railroad, Pyramid, Cascade, Big, and Four Mile Creeks.

**Estimated WDFW Budget and Schedule:**

Year	Task	Total \$	Requested \$ (LC06b1)	Requested PUD Matching \$ (LC06b2)	WDFW Matching \$
2013	Conduct tributary surveys in September & October	\$16,820		\$8,410	\$8,410
2013	Data Mtg. and Reporting.	\$1,544		\$772	\$772
2013	Boat and Vehicle Operating Costs	\$1,852	\$1,852		
2013	Supplies and Equipment	\$2,470	\$2,470		
	<b>2013 Estimated Totals</b>	\$22,686	\$4,322	\$9,182	\$9,182

**3.2.4 Stehekin River Side Channel Trout Spawner Surveys, NPS**

Due to the absence of WCT spawners in any of the 2009-2011 surveys it is recommended that spawning surveys be discontinued from 2012 to 2014 (see Section 2.2.3). Surveys should be reinstated in 2015 for a period of at least three years.

**Estimated Budget and Schedule: No funds requested for 2013**

**3.2.5 Stehekin River Mainstem Trout Abundance Surveys, NPS**

One spring and two late summer/fall snorkel surveys will be conducted at six index pool locations in the lower 7 km of the Stehekin River mainstem. Mainstem depositional zone riffle habitat will be surveyed at two locations during one spring and one early fall visit. Numbers of trout by length categories (<150, 150-299, 300-449, and ≥450 mm) will be recorded. Observed redds will also be recorded during spring surveys. Results will be used to evaluate and refine methods for monitoring recovery of WCT in the Stehekin River.



**Estimated Budget and Schedule:**

<b>Year</b>	<b>Task</b>	<b>Total \$</b>	<b>NPS Requested \$ (LC06b1)</b>	<b>Requested PUD Matching \$ (LC06b2)</b>	<b>NPS Matching \$</b>
2013 Apr-Sept	Conduct one spring and two Aug/Sept snorkel surveys in 6 lower mainstem pools (1-GS/9 Ecologist and 1-GS/6 Bio Tech for total of 12 person-days)	\$3228	\$1300	\$964	\$964
Apr-Sept	Conduct one spring and one fall snorkel survey of mainstem depositional riffle habitat in the lower 10 km of the Stehekin River (1-GS/9 Ecologist and 1-GS/6 Bio Tech for total of 12 person-days)	\$3228		\$1614	\$1614
Apr-Sept	Travel (Ferry and per diem)	\$800	\$800		
Apr-Sept	Vehicle (0.5 months @ \$800/month)	\$400	\$400		
Apr-Sept	Supplies	\$300	\$300		
Nov-Dec	Data Mgt. and Reporting (1- GS9 Ecol. for 12 days, GS12 Ecol. – 3 days)	\$5556		\$2778	\$2778
<b>2013 Estimated Totals:</b>		\$13,512	\$2800	\$5356	\$5356

**3.2.6 Stehekin River Side Channel Trout Abundance Surveys, NPS**

Plans for 2013 include conducting two snorkel surveys during August and September to determine abundance and distribution of trout at all side channel spawner index reaches. Collection of young-of-year samples for genetic species verification will be completed at four side channel locations. Genetic analyses of these samples will be conducted by Carl Ostberg (USGS Western Fisheries Research Center).

**Estimated Budget and Schedule:**

Year	Task	Total \$	NPS Requested \$ (LC06b1)	Requested PUD Matching \$ (LC06b2)	NPS Matching \$
2013 Aug-Sept	Conduct two snorkel surveys (Aug/Sept) in 11 side-channel/trib. index reaches (1-GS/9 Ecologist and 1-GS/6 Bio Tech for total of 16 person-days)	\$4304	\$1734	\$1285	\$1285
Aug-Sept	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 8 person-days)	\$2152	\$866	\$643	\$643
Oct-Dec	USGS –BRD Lab analyses, Data Mgt. and Reporting (100 samples @ \$47/sample including Overhead)	\$4700	\$1700	\$1500	\$1500
Aug-Sept	Travel (Ferry and per diem)	\$520	\$520		
Aug-Sept	Vehicle (0.5 months @ \$800/month)	\$400	\$400		
Aug-Sept	Supplies	\$300	\$300		
Nov-Dec	Data Mgt. and Reporting (1- GS9 Ecol. for 12 days, GS12 Ecol. – 3 days)	\$5556		\$2778	\$2778
<b>2013 Estimated Totals:</b>		\$17932	\$5520	\$6206	\$6206

**3.2.7 Fall Index Stream Kokanee Spawning Surveys, CPUD**

Chelan PUD will conduct annual fall spawning surveys for kokanee and land-locked Chinook salmon in 2013, as recommended the NPS, USDA Forest Service, and WDFW in consultation with the LCFF. The LCFF requested, specifically, that Chelan PUD conduct the kokanee spawning surveys due to its unique expertise in conducting such surveys in the Stehekin River and tributaries to Lake Chelan since 1984. Survey methodology is described in the Lake Chelan Kokanee Spawning Ground Surveys, 2007 report (Keesee and Hemstrom, 2007).

**Estimated Budget and Schedule:**

The cost of conducting kokanee spawning surveys in 2013 is estimated to be \$10,000. Three surveys will be conducted in September and October around peak kokanee spawning. Historic data can be used, and was used in 2012, to estimate peak spawning date. One survey will be conducted one week prior to peak spawning, one during peak spawning, and one the week after peak spawning. While this method will not yield as precise estimates as survey results from previous years, it will provide an accurate estimate of total adult kokanee returns to the index areas that will be comparable to historic survey data. Surveys will be conducted in index reaches of Blackberry Creek and Company Creek, and from the mouth up to the first impassable barriers in Fish, Prince, Safety Harbor, First, and Twenty-five Mile creeks. One survey per season has been conducted in Mitchell, Gold, and Grade creeks as in previous years. Additional surveys may be conducted in these creeks in 2013 due to increased abundance of spawning kokanee observed in 2012.

**3.2.8 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.

**Estimated Budget and Schedule:**

<b>Year</b>	<b>Task</b>	<b>Total \$</b>	<b>Requested \$ (LC06b1)</b>	<b>Requested \$ LC06b2</b>	<b>WDFW Matching \$</b>
2013	Conduct Kokanee Creel Surveys	\$8,886.00		\$4,434.00	\$4,434.00
2013	Data Management	\$1,600.00		\$800.00	\$800.00
2013	Fish, Age/Origin Determination	\$1,200.00		\$600.00	\$600.00
2013	Vehicle Operating Costs	\$800.00	\$800.00		
2013	Sampling Supplies	\$200.00	\$200.00		
	<b>2013 Estimated Totals</b>	\$12,686.00	\$1,000.00	\$5,834.00	\$5,834.00

**3.2.9 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. In 2012, WDFW did not collect eggs for this program and therefore the need to adipose fin clip kokanee is not required in 2013.

**Estimated Budget and Schedule: No funds requested for 2013**

**3.2.10 Tributary Barrier Confirmation and Removal**

Tributaries to Lake Chelan will be monitored by site visits and photomonitoring in 2013 by the CPUD and the USFS to ensure that connectivity to the lake is maintained.

**Summary of 2013 LCFP Expenditures**

<b>Measure</b>	<b>Estimated M&amp;E Cost</b>	<b>Amount to be provided by Chelan PUD</b>	<b>Agency Cost-share</b>	<b>Task</b>
Comprehensive Creel Surveys (WDFW)	\$32,250	\$20,169	\$12,081	Section 3.2.1
Lake Chelan Tributaries Spawning Monitoring and Evaluation (USFS)	\$8,790	\$4,895	\$3,895	Section 3.2.2
Lake Chelan Tributary Estimates of Juvenile Westslope Cutthroat and Rainbow Trout Abundance (WDFW)	\$22,686	\$13,504	\$9,182	Section 3.2.3
Stehekin River Side-Channel Trout Spawner Surveys (NPS)	\$0	\$0	\$0	Section 3.2.4
Stehekin River Mainstem Trout Abundance Surveys (NPS)	\$13,512	\$8,156	\$5,356	Section 3.2.5
Stehekin River Side-Channel Abundance Surveys (NPS)	\$17,932	\$11,726	\$6,206	Section 3.2.6
Fall Index Stream Kokanee Spawning Surveys (PUD)	\$10,000	\$10,000	\$0	Section 3.2.7
Kokanee Creel Survey (WDFW)	\$12,686	\$6,384	\$5,834	Section 3.2.8
Kokanee Stocking Monitoring and Evaluation – Fin Clipping (WDFW)	\$0	\$0	\$0	Section 3.2.9
<b>Total M&amp;E Survey Costs</b>	\$117,856	\$74,834	\$42,554	
Tributary Barriers			N/A	Section 3.2.10
Fish Stocking	\$30,000	\$30,000	N/A	Section 3.1
<b>TOTAL</b>	\$147,856	\$104,834	\$42,554	

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