

**PUBLIC UTILITY DISTRICT NO. 1 of CHELAN COUNTY**

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May 10, 2012

**VIA ELECTRONIC FILING**

Honorable Kimberly D. Bose, Secretary, and  
Nathaniel J. Davis, Sr., Deputy Secretary  
FEDERAL ENERGY REGULATORY COMMISSION  
888 First Street, NE  
Washington, DC 20426

Re: **Lake Chelan Hydroelectric Project No. 637**  
**Article 404 – Lake Chelan Fishery Forum 2012 Annual Work Plan dated**  
**February 17, 2012**

Dear Secretary Bose and Deputy Secretary Davis:

The Federal Energy Regulatory Commission (Commission) issued the “Order Modifying and Approving Lake Chelan Fishery Plan, Article 404” on December 4, 2007. The Plan satisfied the License Article 404 requirement of the “Order on Offer of Settlement and Issuing New License”<sup>1</sup> (License) and “Order on Rehearing”<sup>2</sup> for the Lake Chelan Hydroelectric Project (Project) on November 6, 2006, and April 19, 2007, respectively.

Under Ordering Paragraph (B) modifying the Plan under Article 404, Chelan PUD hereby files the Final Lake Chelan Fishery Forum 2012 Annual Work Plan (LCFF AWP), in which the detailed fish stocking measures are described in Section 3.2. No measures were proposed to be implemented in place of stocking.

On December 15, 2011 the Lake Chelan Fisheries Forum (LCFF) convened a meeting to initiate discussions regarding the fish stocking plan and management objectives, and drafting the Lake Chelan Fishery Forum (LCFF) Annual Work Plan (AWP) for 2012. The Washington Department of Fish and Wildlife (WDFW) provided the first draft of the plan to Chelan PUD on January 10, 2012. WDFW provided tables of fish stocked into Lake Chelan in 2011 and planned stocking levels for 2012 in the draft plan. Chelan PUD provided the first draft of the AWP to the LCFF on January 20, 2012. Chelan PUD received final approval of the plan from the National Park Service (NPS) on January 24, 2012, and final edits and approval of the plan from WDFW on

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<sup>1</sup> 117 FERC ¶ 62,129

<sup>2</sup> 119 FERC ¶ 61,055

*Ms. Kimberly D. Bose, Secretary and Mr. Nathaniel J. Davis, Sr.  
Federal Energy Regulatory Commission*

January 26, 2012. The USDA Forest Service provided project descriptions and edits to the AWP directly to WDFW. Chelan PUD incorporated the comments into the final plan and distributed the final work plan to the LCFE on February 18, 2012.

Please do not hesitate to contact me or Jeff Osborn (509-661-4176) of my office regarding any questions or comments regarding this plan.

Sincerely,



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cc: Erich Gaedeke, FERC-PRO

Enclosure: Lake Chelan Fishery Forum 2012 Annual Work Plan, Final  
Documentation of Consultation

# Lake Chelan Fishery Forum 2012 Annual Work Plan, Final

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**LAKE CHELAN FISHERY FORUM  
2012 ANNUAL WORK PLAN**

**LICENSE ARTICLE 404  
SETTLEMENT AGREEMENT CHAPTER 6**

**FINAL**

**February 17, 2012**

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 Settlement Agreement (SA) and Lake Chelan Fishery Plan is for the National Park Service (NPS), USDA Forest Service, 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 2012 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 West Slope cutthroat, 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 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 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 2010 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 until mid October. 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.

## **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 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 150-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, and 2011 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 1 and 2. Additional summary information can be found in Lake Chelan Cutthroat Trout Spawning Ground Surveys 2009 (Johnson and Archibald 2009).

*Table 1. 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 2. 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 3. 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 4. 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 5. 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 6. 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.

### 2.2.2 Lake Chelan Tributary Estimates of Juvenile Cutthroat and Rainbow Trout Abundance, WDFW

Beginning in 2011 and continuing into 2012, and every third and fourth year thereafter, WDFW will 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. In 2012, WDFW will sample Gold, Prince, Fish and Railroad creeks. If time and manpower allow all or some of the following additional creeks may also be sampled in 2012: Pyramid, Cascade, Big, and Four Mile. If not, these creeks will be surveyed in 2013. This sequence of sampling effort will begin again in 2013 and continue into 2014.

Electrofishing techniques similar to those described in Brown (1984) and DES (2000a) will be used to sample tributary abundance of juvenile WSCT and RBT. Results from data gathered will be compared to those conducted by Brown (1984) and DES (2000a) to estimate population dynamics of WSCT since year 2000; the intent being to evaluate the effectiveness of recent management actions to increase WSCT abundance.

Table 7. Estimated 2011 Lake Chelan Tributary Rainbow Trout Species Composition, Density and Population Abundance.

<b>Rainbow</b>						
	Site estimates		Sample site	All Rainbow per	Available Habitat <sup>2</sup>	Rainbow Population
Tributary	All RB	YOY <sup>a</sup>	Area (M <sup>2</sup> )	(M <sup>2</sup> )	Area (M <sup>2</sup> )	Estimate
First Creek	16 (16.0-16.6) <sup>c</sup>	11 (11.0-11.9)	82.3	0.19	6,208	1,207
Twenty Five Mile Creek	31 (28.0- 38.5)	25 (25.0 27.3)	147.5	0.21	12,288	2,583
Mitchell Creek	13 (13.0-13.2)	10 (10-10.2)	51.4	0.25	1,686	426
Grade Creek	15 (15.0-15.6)	4 (4.0-4.7)	73.9	0.20	1,168	237
Safety Harbor Creek	31 (31.0-31.8)	8 (8.0-9.0)	259.9	0.12	1,356	162

Table 8. Estimated 2011 Lake Chelan Tributary Cutthroat Trout Species Composition, Density and Population Abundance.

<b>Cutthroat</b>						
	Site estimates		Sample site	All Cutthroat per	Available Habitat	Cutthroat Population
Tributary	All CUTT	YOY	Area (M <sup>2</sup> )	(M <sup>2</sup> )	Area (M <sup>2</sup> )	Estimate
First Creek	10 (8.0-20.7)	3 (3.0-6.1)	82.3	0.12	6,208	754
Twenty Five Mile Creek	0 (---)	0 (---)	147.5	0	12,288	0
Mitchell Creek	1 (---)	0 (---)	51.4	0.02	1,686	33
Grade Creek	0 (---)	0 (---)	73.9	0	1,168	0
Safety Harbor Creek	14 (13.0-14.7)	0 (---)	259.9	0.05	1,356	73

*Table 9. Estimated 2011 Lake Chelan Tributary Total of All Rainbow & Cutthroat Trout Species Composition, Density and Population Abundance.*

<b>Total of All Rainbow &amp; Cutthroat Trout</b>	
<b>Tributary</b>	<b>Estimate</b>
First Creek	1,961
Twenty Five Mile Creek	2,583
Mitchell Creek	459
Grade Creek	237
Safety Harbor Creek	235

### **2.2.3. Stehekin River Tributary/Side-Channel Cutthroat and Rainbow Trout Spawner Surveys, NPS**

Rainbow trout and cutthroat trout spawner surveys, in selected Stehekin River side-channels and tributary index reaches were initiated by NPS staff in 2009 in order to evaluate progress towards restoration of adfluvial westslope cutthroat trout. The objective was to annually monitor trends in abundance of cutthroat and rainbow trout spawners (April 15- June 30) at 12 tributary and side-channel index reaches in the lower 8 miles of the Stehekin River.

During 2009, initial habitat surveys (Anthony and Glesne 2010) of all side-channels and tributaries of the lower 8 miles of the Stehekin River were conducted for the purpose of selecting cutthroat and rainbow trout spawner 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.

During 2009 and 2010, four rainbow and cutthroat trout spawning surveys were conducted between mid-April and late June (Anthony and Glesne 2010, Anthony 2011, in prep.). During 2009, fish were observed at 5 of the 12 index reaches. Cutthroat trout were not observed during any of the surveys. A total of 11 adult rainbow trout and one unidentified fish were observed during the four surveys. Thirteen redds were observed in the 4 index reaches and two of these had rainbow trout spawners holding over them. During 2010, a total of 9 fish were observed at 6 of the 12 index reaches and as in 2009 they were all rainbow trout. Nine unknown redds were also observed at one of the index reaches in 2010.

Index stream spawner surveys were again repeated during 2011. Three surveys were conducted between April 26<sup>th</sup> and June 29<sup>th</sup>. As in 2009 and 2010, there were no cutthroat spawners observed in any of the index reach surveys. Seven rainbow trout spawners, four rainbow trout redds, and 14 unknown redds were observed in the index reaches.

Due to the absence of cutthroat spawners in any of the 2009-2011 surveys it is recommended that they be discontinued in 2012. Experimental stocking of cutthroat fry is currently recommended for a limited number of index reaches. Spawner surveys should be reinstated in 2016 to evaluate any improvements resulting from supplemental stocking and/or natural recruitment. In the interim period efforts to evaluate adfluvial cutthroat trout 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 is nearly completed (Anthony and Glesne 2012; currently in peer review).

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

Despite the apparent lack of spawning cutthroat trout in Stehekin River tributary and side-channel index sites (Section 2.2.3.), a number of large (380-460 mm) cutthroat trout were viewed in the mainstem Stehekin River during the late fall and autumn 2010 kokanee surveys. Though not observed while spawning, these observations confirm the presence of large, potentially adfluvial cutthroat in the Stehekin River system. In light of these observations it was decided to increase our survey efforts in 2011 to include snorkeling mainstem pools. Eight large channel spanning pools were identified in the lower 7 km of the mainstem Stehekin River. Snorkel surveys of these eight pools were completed once in the early spring, and six of the eight pools were surveyed twice in the late summer during periods of low river discharge and good underwater visibility. The two pools that were not surveyed in the latter surveys were determined to be poor candidate sites for long term monitoring due to flow and habitat conditions.

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. Adfluvial size cutthroat trout ( $\geq 300$  mm) were observed in four of the eight pools surveyed on five occasions between April 27<sup>th</sup> and August 30<sup>th</sup>. Adfluvial size rainbow trout were observed in all eight pools surveyed on 14 occasions during the same time period. Both rainbow and cutthroat trout were most abundant during the April 27<sup>th</sup> sampling date, coinciding with spring spawning.

Four of the eight pools surveyed in 2011 were selected for continuing surveys in 2012. Pool selection was based on documented cutthroat trout presence and safety of conducting snorkel surveys within the pool. A report including methods, results, and pool location maps will be completed by April 2012.

### **2.2.5 Stehekin River Tributary and Side-Channel Summer Cutthroat and Rainbow Trout Surveys, NPS**

The 2009-2011 spawner surveys failed to confirm the presence of cutthroat in any of the spawner survey index reaches. As a result, exploratory fish surveys focused on documenting summer and fall abundance of cutthroat and rainbow trout in side-channel and tributary habitat were implemented in 2011. Surveys were conducted during late July, late August, and early September of 2011. Visual observations and snorkel surveys were used to document species presence and their abundance at 11 of the 12 spawner survey index reaches (Section 2.2.3) during late July and 10 of the index reaches in late August. Cutthroat trout were not observed at any of the index reaches during the late July survey and only two adfluvial size rainbows ( $\geq 300$  mm) and one sub-adult rainbow trout were observed. During the late August survey, a total of eight adfluvial cutthroat trout were observed in five of the index reaches. Juvenile cutthroat trout were not observed during this survey. Juvenile and sub-adult rainbow trout ( $< 300$  mm) were abundant and observed in all of the 10 index reaches surveyed however, adfluvial size rainbow trout were not observed in the late August survey.

The main objective of the September, 10-12 sampling period was to collect young-of-year fish for genetic analysis to provide definitive species information needed to verify successful spawning of cutthroat trout in four of the spawner survey index reaches. Species composition of these samples will also be useful in determining the frequency of rainbow and cutthroat 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 (two in Blackberry Creek and two in Company Creek). Genetic analyses of these 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, 2012. Additional young-of-year samples should be collected from other spawner index reaches in 2012.

In addition to young-of-year sampling, observations and angling were used to document the presence of adfluvial cutthroat and rainbow trout during the September survey. A total of seven cutthroat trout and one rainbow x cutthroat hybrid, all ranging in size from 380-430 mm, were observed during the survey. Tissue samples for genetic analysis were collected from three of these fish caught by angling. Because of these notable observations, increased effort to monitor adfluvial fish in side-channels during the late summer and fall is recommended for 2012.

### **2.2.6 Monitor Frequency of Non-Native Rainbow Genetic Introgression in Native 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 rainbow trout and native cutthroat trout. Sites were selected to represent the gradient of introgression ranging from pure cutthroat trout to a mixture of pure fish, F1 and post-F1 hybrids to mostly pure rainbow trout as previously documented in the Ostberg and Rodriguez (2006) publication. Sampling locations corresponded to reach numbers designated in Ostberg and Rodriguez (2006; representing samples

collected between 1999 and 2003) publication (below and in Figure 1). Non-lethal tissue samples were collected from 48-50 fish from all of the locations listed below except Location 7, where 24 samples were collected.

- Location 1 (upper Stehekin; SR6)
- Location 2 (Stehekin River above Bridge Creek confluence; SR4)
- Location 3 (Bridge Creek between McAlester and South Fork tribs; BR5)
- Location 4 (Bridge Creek near confluence with Stehekin; BR1)
- Location 5 (North Fork of Bridge Creek; NF)
- Location 6 (Stehekin River below Bridge Creek confluence; SR1 and SR2)
- Location 7 (lower Stehekin River below confluence of Agnes Creek; previously unsampled)

Laboratory analyses have been completed (USGS-WFRC, Seattle) and a draft journal submission is currently in peer review. Tentative results provided by Carl Ostberg indicate that there has not been any significant change in the frequency of westslope cutthroat, rainbow trout, and hybrids between the two time periods at any of the locations sampled. The 24 samples taken from the new location in the lower Stehekin below Agnes Creek confluence resulted in mostly rainbow trout as expected (22 rainbow and 2 hybrids).



**(b) Genetic Introgression in Cutthroat Trout**  
(Ostberg and Rodriguez 2006)

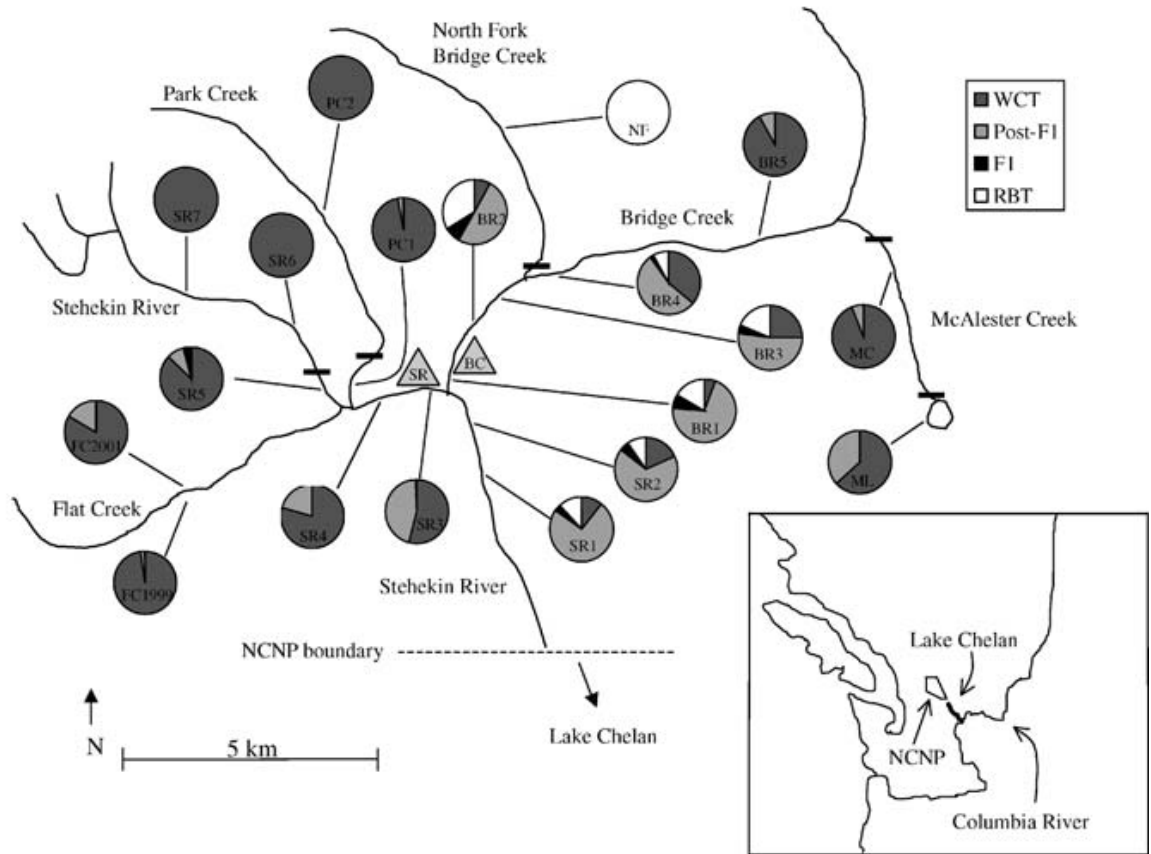


Figure 1. Genetic introgression in cutthroat trout collected between 1999 and 2003 in the Stehekin River Basin.

It is recommended that we continue to monitor cutthroat introgression every five to ten years to evaluate cutthroat trout status and progress towards cutthroat trout 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 maintain this, 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. 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.

### **2.3.2 Mainstem Stehekin River and Tributary/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 side-channels/tributaries in the lower 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 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/tributary 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/tributary habitat was determined using the Area Under the Curve Method (AUC: Beidler and Nickelson 1980). Tentative results show a total of 50,580 kokanee using the mainstem Stehekin channel and 131,568 kokanee using the side-channel/tributary habitat. Total kokanee spawner escapement was estimated at 182,148 fish. A detailed report will be nearly completed by NPS-NOCA staff and should be available by May 2012.

Replication of this survey is recommended at three to five year intervals. Results can 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, 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 LCFE 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 LCFE 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.

### ***SECTION 3: MEASURES TO BE IMPLEMENTED IN 2012***

The following addresses Tributary Barriers, Fish Stocking, and the Monitoring and Evaluation Program measures that will be implemented in 2012.

#### **3.1 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 effect 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 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.

### **3.2 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)).

In 2009, WDFW released approximately 50,000 WSCT (at a size of 15 fish/pound) at Lakeside and Mill Bay in March, and approximately 70,000 triploid RBT (at a size of 3 fish/pound) at Lakeside in August and September (Art Viola, WDFW, pers. com.). Approximately 227,000 kokanee fingerlings, taken from broodstock collected in fall 2006 from the Stehekin River, were released into Lake Chelan near the Yacht Club in May (at a size of 75 fish/lb.). Additionally, approximately 175,000 WSCT fry were released into Twenty-five Mile, Mitchell, Prince, Safety Harbor, Fish, Grade, and First creeks (at a size of 600 fish/lb.) in June and July.

The stocking plan from WDFW for 2010 is shown in Table 5 (Art Viola, WDFW, pers. com.).

**Table 5. 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

The actual number of fish released by WDFW into Lake Chelan in 2010 is presented in Table 6 (Corey Morrison, WDFW, pers. com.).

**Table 6. 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 7 below (Corey Morrison, WDFW, pers. com.).

**Table 7. 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

The actual number of fish released by WDFW into Lake Chelan in 2011 is presented in Table 8 (Corey Morrison, WDFW, pers. com.).

**Table 8. 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
	Cutthroat	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 program is not funded by Chelan PUD

The stocking plan from WDFW for 2012 is shown in Table 9 below (Travis Maitland, WDFW, pers. com.).

**Table 9. 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

### **3.3 Monitoring and Evaluation Program**

#### **3.3.1 Comprehensive Creel Surveys, WDFW**

Comprehensive creel surveys will be conducted beginning in 2010. Surveys are designed to: 1) monitor the contribution (*naturally produced or hatchery released*) of Westslope cutthroat, 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. The next Comprehensive Creel Survey will be completed in 2013.

#### **Estimated Budget and Schedule: No funds requested for 2012**

#### **3.3.2 2012 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:**

Year	Task	Total \$	Requested \$ (LC06b1)	Requested PUD Matching \$ (LC06b2)	USFS Matching \$
2012 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>2012 Estimated Totals</b>	<b>\$8,790</b>	<b>\$1,000</b>	<b>\$3,895</b>	<b>\$3,895</b>

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

Beginning in 2011 and continuing into 2012, and every third and fourth year thereafter, WDFW will 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. In 2012, WDFW will sample Gold, Prince, Fish and Railroad creeks. If time and manpower allow all or some of the following additional creeks may also be sampled in 2012: Pyramid, Cascade, Big, and Four Mile. If not, these creeks will be surveyed in 2013. This sequence of sampling effort will begin again in 2013 and continue into 2014.

**Estimated WDFW Budget and Schedule:**

Year	Task	Total \$	Requested \$ (LC06b1)	Requested PUD Matching \$ (LC06b2)	WDFW Matching \$
2012	Salaries	\$13,087.18		\$6,543.59	\$6,543.59
2012	Benefits	\$1,327.84		\$663.92	\$663.92
2012	Goods and Services	\$381.10	\$381.10		
2012	Travel	\$1,081.50	\$1,081.50		
2012	Total Direct Costs	\$15,877.62	\$1,462.60	\$7,207.51	\$7,207.51
2012	WDFW overhead @23.51%	\$3,732.84	\$343.86	\$1,694.49	\$1,694.49
	<b>2012 Estimated Totals</b>	<b>\$19,610.46</b>	<b>1,806.46</b>	<b>\$8,902.00</b>	<b>\$8,902.00</b>

### ***3.3.4 Stehekin River Tributary/Side-Channel Cutthroat and Rainbow Trout Spawner Surveys, NPS***

Due to the absence of cutthroat spawners in any of the 2009-2011 surveys it is recommended that they be discontinued in 2012 (see Section 2.2.3). Experimental stocking of cutthroat fry is currently recommended for sections of the Company and Blackberry Creek side-channels containing suitable rearing habitat and that also include four of the spawning survey index reaches.

A total of 78,750 cutthroat fry will be stocked in the Company Creek side-channel (2.5 km, 17,500 m<sup>2</sup> surface area) and 81,900 cutthroat fry in the Blackberry Creek side-channel (1.4 km, 18,200 m<sup>2</sup> surface area). Both channels have an average depth of approximately 0.5 m. Spawner surveys should be reinstated in 2016 to evaluate any improvements resulting from supplemental stocking and/or natural recruitment.

**Estimated Budget and Schedule: No funds requested for 2012**

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

Despite the apparent lack of spawning cutthroat trout in Stehekin River tributary and side-channel index sites (Section 2.2.3), a number of large, 380-460 mm, cutthroat trout were viewed in the mainstem Stehekin River during the late fall and autumn 2010 confirming the presence of large, potentially adfluvial cutthroat in the Stehekin River system.

Lower mainstem Stehekin River exploratory spring and fall snorkel surveys of pool/tail-out habitat were conducted in 2011. The objectives of these surveys were to gain a better understanding of adfluvial cutthroat trout 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 rainbow trout. Results provided additional confirmation of large adfluvial cutthroat trout use in the mainstem Stehekin River and recommendations were made to continue snorkel surveys at four of the index pools during successive years (see Section 2.2.4). In addition, it is recommended that exploratory snorkel surveys of depositional zone riffle habitat be conducted in the lower 10 km of the mainstem in order to expand data collection efforts to all potential habitat utilized by adfluvial cutthroat trout in the mainstem.

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

**Estimated Budget and Schedule:**

Year	Task	Total \$	NPS Requested \$ (LC06b1)	Requested PUD Matching \$ (LC06b2)	NPS Matching \$
2012 Apr-Sept	Conduct one spring snorkel survey and two Aug/Sept surveys in 4 lower mainstem pools (1-GS/9 Ecologist and 1-GS/6 Bio Tech for total of 12 person-days)	\$2963	\$1035	\$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 16 person-days)	\$3950		\$1975	\$1975
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)	\$5068		\$2534	\$2534
<b>2012 Estimated Totals:</b>		\$13,481	\$2535	\$5473	\$5473

**3.3.6 Stehekin River Tributary/Side-Channel Summer Cutthroat and Rainbow Trout Surveys, NPS**

Exploratory surveys designed to supplement information from the tributary and side-channel cutthroat and rainbow trout spawner surveys were conducted at spawner index reaches in July and August of 2011. Another survey was conducted in September, but was limited to only four spawner index reaches located in the Blackberry and Company Creek side-channels. Young-of-year cutthroat and rainbow were collected at these four index reaches for genetic analysis to provide definitive species information needed to verify successful spawning of cutthroat trout. In addition, observations and angling at these four sites revealed the presence of a significant number of large adfluvial cutthroat trout which likely moved into these side-channels to feed on kokanee eggs (see Section 2.2.5).

Plans for 2012 include conducting snorkel and visual observation surveys during August and September to determine abundance and distribution of adfluvial cutthroat and rainbow trout at all of the tributary/side-channel spawner index reaches. Juvenile cutthroat and rainbow trout abundance and other species abundance information will also be collected during these surveys. Collection of young-of-year samples for genetic species verification will be completed at three more spawner index reaches. 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 \$
2012 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)	\$3950	\$1380	\$1285	\$1285
Aug-Sept	Collect cutthroat/rainbow young-of-year for genetic analysis in three previously unsampled spawner index reaches (1-GS/9 Ecologist and 1-GS/6 Bio Tech for total of 8 person-days)	\$1976	\$690	\$643	\$643
Oct-Dec	USGS –BRD Lab analyses, Data Mgt. and Reporting (75 samples @ \$40/sample including Overhead)	\$3000	\$1000	\$1000	\$1000
Aug-Sept	Travel (Ferry and per diem)	\$520	\$520		
Aug-Sept	Vehicle (0.25 months @ \$800/month)	\$200	\$200		
Aug-Sept	Supplies	\$300	\$300		
Nov-Dec	Data Mgt. and Reporting (1- GS9 Ecol. for 12 days, GS12 Ecol. – 3 days)	\$5068		\$2534	\$2534
<b>2012 Estimated Totals:</b>		\$15014	\$4090	\$5462	\$5462

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

Chelan PUD will conduct annual fall spawning surveys for kokanee and land-locked Chinook salmon in 2012, 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). Results of 2011 kokanee spawning surveys are contained in the [Lake Chelan Kokanee Spawning Ground Surveys, 2011 Final Report](http://www.chelanpud.org/departments/licensingCompliance/lc_implementation/ResourceDocuments/38176.pdf) at the following link: [http://www.chelanpud.org/departments/licensingCompliance/lc\\_implementation/ResourceDocuments/38176.pdf](http://www.chelanpud.org/departments/licensingCompliance/lc_implementation/ResourceDocuments/38176.pdf)

**Estimated Budget and Schedule:**

The cost of conducting kokanee spawning surveys in 2012 is estimated to be \$12,000. Weekly surveys will be conducted beginning in early September and continuing through mid-October or until the kokanee run ends. 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 in previous years. Additional surveys may be conducted in these creeks in 2012 due to increased abundance of spawning kokanee observed in 2011.



**3.3.8 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 fish species and origin (naturally produced or hatchery released) contributing to the sport fishery; and 2) determine what species of fish anglers prefer to catch.

Year	Task	Total \$	Requested \$ (LC06b1)	Requested \$ LC06b2	WDFW Matching \$
2012	Salaries	\$4,808.04		\$2,404.02	\$2,404.02
2012	Benefits	\$1,103.28		\$551.64	\$551.64
2012	Goods & Services	\$901.25	\$901.25		
2012	Travel	\$568.05	\$568.05		
2012	WDFW overhead @23.51%	\$1,735.19	\$345.43	\$694.88	\$694.88
	<b>2012 Estimated Totals</b>	\$9,115.81	\$1,814.73	\$3,650.72	\$3,650.72

**3.3.9 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.

**Summary of 2012 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)	\$0	\$0	\$0	Section 3.3.1
Lake Chelan Tributary Trout Spawning Surveys (USFS)	\$8,790	\$4,895	\$3,895	Section 3.3.2
Lake Chelan Tributary Estimates of Juvenile Cutthroat and Rainbow Trout Abundance (WDFW)	\$19,611	\$10,709	\$8,902	Section 3.3.3
Stehekin River Tributary/Side-Channel Cutthroat and Rainbow Trout Spawner Surveys (NPS)	\$0	\$0	\$0	Section 3.3.4
Stehekin River Mainstem Cutthroat and Rainbow Trout Surveys (NPS)	\$13,481	\$8,008	\$5,473	Section 3.3.5
Stehekin River Tributary/Side-Channel Summer Cutthroat and Rainbow Trout Surveys (NPS)	\$15,014	\$9,552	\$5,462	Section 3.3.6
Fall Index Stream Kokanee Spawning Surveys (PUD)	\$12,000	\$12,000		Section 3.3.7
Kokanee Creel Survey (WDFW)	\$9,117	\$5,466	\$3,651	Section 3.3.8
Kokanee Stocking Monitoring and Evaluation – Fin Clipping (WDFW)	\$6,200	\$6,200		Section 3.3.9
<b>Total M&amp;E Survey Costs</b>	<b>\$84,213</b>	<b>\$56,830</b>	<b>\$27,383</b>	
Tributary Barriers			N/A	Section 3.1
Fish Stocking	\$30,000	\$30,000	N/A	Section 3.2
<b>TOTAL</b>	<b>\$114,213</b>	<b>\$86,830</b>	<b>\$27,383</b>	

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# DOCUMENTATION OF CONSULTATION

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October 12, 2011: Chelan PUD email to Forum  
November 8, 2011: Chelan PUD email to Forum  
November 15, 2011: Chelan PUD email to Forum  
January 10, 2012: WDFW email Chelan PUD  
January 20, 2012: Chelan PUD email to Forum  
February 18, 2012: Chelan PUD email to Forum

## Sokolowski, Rosana

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**From:** Osborn, Jeff  
**Sent:** Wednesday, October 12, 2011 9:46 AM  
**To:** Alex Martinez; Bitterman, Deborah; Bob Goedde; Bruce Heiner; Carl Merkle; Catherine Willard; Graham Simon; Hays, Steve; Jeff Korth; Jerry Marco; Miller, Joseph; Nicky Markey; Osborn, Jeff; Pat Irle; Reed Glesne; Smith, Michelle; Steve Lewis; Truscott, Keith  
**Subject:** Lake Chelan Fishery Forum 2012 Annual Work Plan  
**Attachments:** LCFF 2011 Final Work Plan (2).docx; LCFF budget table example.docx

Dear Lake Chelan Fishery Forum: It is that time of year when we need to begin developing the Lake Chelan Fishery Forum Annual Work Plan (AWP) for 2012. Attached is the final version of the Lake Chelan Fishery Forum 2011 AWP as a template for developing the 2012 plan. Also, attached is a new table that is being proposed for projects to be implemented in 2012, described in Section 3 of the 2012 AWP, to assist in tracking and budgeting funds from the committed and matching Monitoring and Evaluation Program funding sources. The two Monitoring and Evaluation Program funding sources have been identified as LC06b1 (committed) and LC06b2 (matching).

My recollection (although frequently faulty) is that Reed Glesne, NPS, took the lead in preparing the first draft of the 2011 AWP, so WDFW is up for leading the development of the first draft 2012 AWP. Graham Simon has been identified as the new lead for WDFW on the Lake Chelan Forums, so please send your edits to the 2011 AWP to him for the first draft 2012 plan. Once a first draft is prepared, I will schedule a meeting of the LCFF to finalize the plan for 2012. After finalizing the plan, I will work with Rosana Sokolowski to get the projects into the PUD budgeting and tracking systems for 2012.

Per the Settlement Agreement, the final Annual Work Plan is due to the PUD by January 10, 2012. As always, please feel free to contact me if you have any questions or I can provide assistance.

**Jeff Osborn**  
**License Program Coordinator**  
**Natural Resources Programs**  
**Public Utility District No. 1 of Chelan County**  
**327 North Wenatchee Avenue**  
**PO Box 1231**  
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**Email: [jeff.osborn@chelanpud.org](mailto:jeff.osborn@chelanpud.org)**

**Lake Chelan Fishery Forum  
Annual Work Plan Budget Table Example**

**October 2011**

<b>Year</b>	<b>Task</b>	<b>Total \$</b>	<b>USFS Requested \$ (LC06b1)</b>	<b>USFS Matching \$</b>	<b>Requested PUD Matching \$ (LC06b2)</b>
2011 Apr-Jun	Install temperature data loggers and Conduct weekly spawning surveys at 3 tributary adfluvial zones. (GS11 Fish Bio and GS5 Fish Tech for 11 days)	\$2,700		\$1,350	\$1,350
Fall	Conduct snorkel surveys in 3 adfluvial tributary zones. (GS5 & GS11 Fish Bios for total of 4 crew-days)	\$1,000		\$500	\$500
Apr-Jul	USFS boat fuel	\$1,000	\$1,000		
Apr-Jul	USFS boat driver	\$3025		\$1,512	\$1,513
Nov- Dec	Data Mgt. and Reporting (GS11 Fish Bio. for 5 person-days)	\$1,348		\$674	\$674
	<b>2011 Estimated Totals</b>	<b>\$9073</b>	<b>\$1,000</b>	<b>\$4,036</b>	<b>\$4,037</b>

# **LAKE CHELAN FISHERY FORUM 2011 ANNUAL WORK PLAN**

**LICENSE ARTICLE 404  
SETTLEMENT AGREEMENT CHAPTER 6**

**FINAL**

**May 24, 2011**

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 Settlement Agreement (SA) and Lake Chelan Fishery Plan is for the National Park Service (NPS), USDA Forest Service, 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 2011 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 West Slope cutthroat, 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 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 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 2010 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 until mid October. 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.

## **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 ground surveys 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 cutthroat trout spawning populations prior to treatment of fish passage barriers in tributary streams.

During the spawning season (April-June) Forest Service fish biologists will 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 is expected 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 will conduct snorkel surveys in each stream in the fall to search for young-of-the-year. Snorkelers will survey, approximately 150-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 and 2010 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 1 through 4. Additional summary information can be found in Lake Chelan Cutthroat Trout Spawning Ground Surveys 2009 (Johnson and Archibald 2009) and 2010 Lake Chelan Tributaries Spawning Monitoring and Evaluation (Willard 2010).

Table 1. 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 2. 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

Table 3. 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 4. 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

### 2.2.2 Lake Chelan Tributary Estimates of Juvenile Cutthroat and Rainbow Trout Abundance, WDFW

Beginning in 2010 and continuing into 2011, and every third and fourth year thereafter, WDFW will sample First, 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. If time and manpower allow all or some of the following additional seven creeks may also be sampled in 2010: Twenty-five Mile, Pyramid, Graham Harbor, Coyote, Castle, Deep Harbor and Lone Fir creeks. If not, these creeks will be surveyed in 2011. This sequence of sampling effort will begin again in 2013 and continue into 2014.

Electrofishing techniques similar to those described in Brown (1984) and DES (2000a) will be used to sample tributary abundance of juvenile WSCT and RBT. Results from data gathered will be compared to those conducted by Brown (1984) and DES (2000a) to estimate population dynamics of WSCT since year 2000; the intent being to evaluate the effectiveness of recent management actions to increase WSCT abundance.

### **2.2.3. Stehekin River Tributary/Side-Channel Cutthroat and Rainbow Trout Spawner Surveys, NPS**

The objective is to annually monitor trends in abundance of cutthroat and rainbow trout spawners (April 15- June 30) at 12 tributary and side-channel index reaches in the lower 8 miles of the Stehekin River. Results will be used to evaluate progress towards restoration of adfluvial/fluvial westslope cutthroat trout and management efforts directed at reduction of non-native rainbow trout in the lower Stehekin River.

During 2009, initial habitat surveys (Anthony and Glesne 2010) of all side-channels and tributaries of the lower 8 miles of the Stehekin River were conducted for the purpose of selecting cutthroat and rainbow trout spawner 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.

During 2009 and 2010, four rainbow and cutthroat trout spawning surveys were conducted between mid-April and late June (Anthony and Glesne 2010, Anthony 2011, in prep.). During 2009, fish were observed at 5 of the 12 index reaches. Cutthroat trout were not observed during any of the surveys. A total of 11 adult rainbow trout and one unidentified fish were observed during the four surveys. Thirteen redds were observed in the 4 index reaches and two of these had rainbow trout spawners holding over them. During 2010, a total of 9 fish were observed at 6 of the 12 index reaches and as in 2009 they were all rainbow trout. Nine unknown redds were also observed at one of the index reaches in 2010.

Index stream spawner surveys will be repeated during 2011. Four to five snorkel and/or visual observation spawner and redd surveys will be conducted at each of the index sites during April 15 through June 30.

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

Despite the apparent lack of spawning cutthroat trout in Stehekin River tributary and side-channel index sites (Section 2.2.3.1), a number of large, 15”-18” cutthroat trout were viewed in the mainstem Stehekin River during the late fall and autumn 2010 kokanee surveys. Though not observed while spawning, these observations confirm the presence of large, potentially adfluvial cutthroat in the Stehekin River system.

To compliment information collected from the tributary/side-channel surveys additional mainstem Stehekin River exploratory spring and fall snorkel surveys will be conducted in 2011 to assess progress towards restoration of adfluvial/fluvial westslope cutthroat trout and management efforts directed at reduction of non-native rainbow trout.

Eight potential large pool survey locations have been identified in the lower 7km of the mainstem channel. Four to six of these sites will be selected for surveys based on the presence of suitable spawning substrate (10-70mm) and water velocity in the pools and associated tail-outs. Two 3-pass snorkel surveys will be conducted at each of the selected

sites during the spring spawning season. One 3-pass snorkel survey will be conducted at each of the selected sites during late September. Numbers of rainbow and cutthroat trout spawners and holding fish (< 6 in, 6-12in, >12-18in, and >18in) will be recorded. All observed redds will also be recorded. Results will be used to evaluate and refine methods for monitoring recovery of westslope cutthroat trout in the Stehekin River.

#### ***2.2.5 Stehekin River Tributary/Side-Channel Juvenile Cutthroat and Rainbow Trout Surveys, NPS***

This is an exploratory survey (2011) designed to supplement information from the tributary and side-channel cutthroat and rainbow trout spawner surveys (Section 2.2.3). The 2009 and 2010 spawner surveys failed to confirm the presence of cutthroat in any of the spawner survey index reaches. Results from this study would be used to confirm the presence or absence of cutthroat trout in our spawner index reaches and provide baseline abundance information for future evaluations of cutthroat recovery in the lower Stehekin.

Relative abundance (electrofishing CPE) and distribution of juvenile cutthroat and rainbow trout would be documented in a representative sample of four to five of the spawner survey index reaches. The presence of hybrid cutthroat x rainbow trout in the lower Stehekin makes species verification difficult particularly with fry and juvenile fish. To overcome this problem non-lethal tissue samples will be collected for genetic analyses to verify species information, separating cutthroat from rainbow trout and cutthroat x rainbow hybrids following methods in Ostberg and Rodriguez (2006). A single pooled sample of tissue from 50 fish will be evaluated for this analysis.

Results of this study will be used to refine future monitoring efforts focused on evaluating progress towards recovery of cutthroat trout in the Stehekin River.

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

During 2010, fish tissue samples were collected at five Stehekin River locations distributed throughout the drainage to monitor the level and frequency of hybridization between non-native rainbow trout and native cutthroat trout. Currently, laboratory analyses are being conducted by Carl Ostberg (USGS-WFRC, Seattle) and results will be reported in 2011. Results will be compared with baseline data from fish collected in 2001-2003 (Ostberg and Rodriguez 2006) to evaluate cutthroat trout status and progress towards cutthroat trout restoration in the watershed.

Non lethal tissue samples were collected from 50 fish at each of five sampling locations. Sites were selected to represent the gradient of introgression ranging from pure cutthroat trout to a mixture of pure fish, F1 and post-F1 hybrids to mostly pure rainbow trout as previously documented in the Ostberg and Rodriguez (2006) publication. Sampling locations corresponded to reach numbers designated in Ostberg and Rodriguez (2006) publication (below and in Figure 1).



- Location 1 (upper Stehekin; SR6 and SR7- pure westslope cutthroat )
- Location 2 (Stehekin River above Bridge Creek confluence; SR3 and SR4 - primarily pure cutthroat and post-F1 hybrids)
- Location 3 (Bridge Creek between McAlester and South Fork tribs; BR5 - primarily pure cutthroat with some post-F1 hybrids)
- Location 4 (Stehekin River below Bridge Creek confluence; SR1 and SR2, and Lower Bridge Creek; BR1- primarily post-F1 hybrids with a mixture of pure rainbow, pure cutthroat, and F1 hybrids)
- Location 5 (lower Stehekin River below confluence of Agnes Creek; previously unsampled- expected to be primarily rainbow trout).

This study was previously proposed to be repeated on a five to ten year interval. The need for future evaluations of cutthroat trout introgression in the Stehekin River will be addressed following completion of the 2010 study report.

### Genetic Introgression in Cutthroat Trout (Ostberg and Rodriguez 2006)

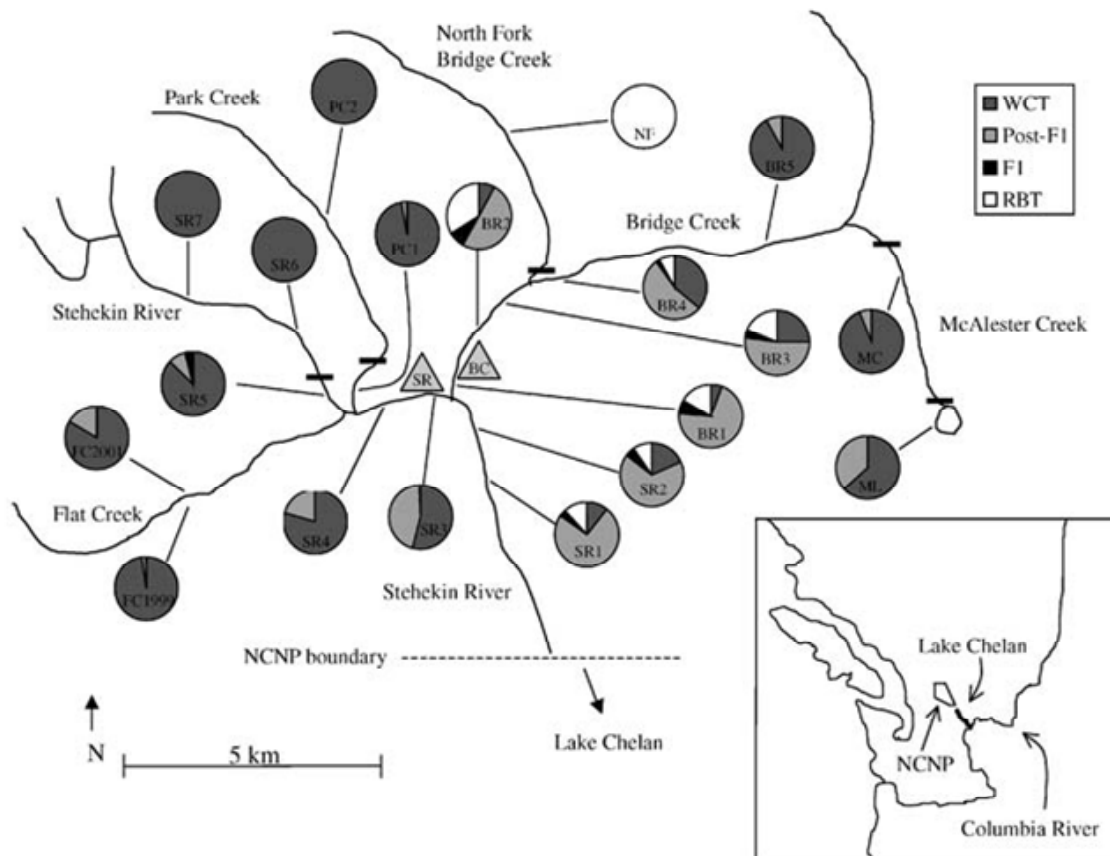


Figure 1. Genetic introgression in cutthroat trout collected between 2001 and 2003 in the Stehekin River Basin.

### **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 maintain this, 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. 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 LCFE 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.

#### ***2.3.2 Mainstem Stehekin River and Tributary/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 side-channels/tributaries in the lower 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 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/tributary 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/tributary habitat was determined using the Area Under the Curve Method (AUC: Beidler and Nickelson 1980). Tentative results show a total of 67,440 kokanee using the mainstem Stehekin channel and 131,481 kokanee using the side-channel/tributary habitat. Total kokanee spawner escapement was estimated at 198,921 fish. A detailed report will be completed by NPS-NOCA staff in 2011.

Replication of this survey is recommended at every three to five year intervals. Results can be used to calibrate annual index station 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 \$5,000 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, 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.

### ***SECTION 3: MEASURES TO BE IMPLEMENTED IN 2011***

The following addresses Tributary Barriers, Fish Stocking, and the Monitoring and Evaluation Program measures that will be implemented in 2011.

#### **3.1 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 effect 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](http://www.chelanpud.org/lc-Resource-Documents-LCFF)):

**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 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.
3. 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.
4. 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.



**3.2 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)).

In 2009, WDFW released approximately 50,000 WSCT (at a size of 15 fish/pound) at Lakeside and Mill Bay in March, and approximately 70,000 triploid RBT (at a size of 3 fish/pound) at Lakeside in August and September (Art Viola, WDFW, pers. com.). Approximately 227,000 kokanee fingerlings, taken from broodstock collected in fall 2006 from the Stehekin River, were released into Lake Chelan near the Yacht Club in May (at a size of 75 fish/lb.). Additionally, approximately 175,000 WSCT fry were released into Twenty-five Mile, Mitchell, Prince, Safety Harbor, Fish, Grade, and First creeks (at a size of 600 fish/lb.) in June and July.

The stocking plan from WDFW for 2010 is shown in Table 5 (Art Viola, WDFW, pers. com.).

**Table 5. 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

The actual number of fish released by WDFW into Lake Chelan in 2010 is presented in Table 6 (Corey Morrison, WDFW, pers. com.).

**Table 6. 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 7 below (Corey Morrison, WDFW, pers. com.).

**Table 7. 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

### 3.3 Monitoring and Evaluation Program

#### **3.3.1 Comprehensive Creel Surveys, WDFW**

Comprehensive creel surveys will be conducted beginning in 2010. Surveys are designed to: 1) monitor the contribution (*naturally produced or hatchery released*) of Westslope cutthroat, 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.

**Estimated Budget and Schedule:**

Year	Task	Total \$	Requested \$	WDFW Matching \$
2011	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.	\$13,608	\$6,804	\$6,804
	Fish age determination from scale and/or otoliths samples	\$500	\$250	\$250
	Boat and Vehicle fuel costs	\$3,500	\$3,500	-0-
	Supplies and equipment	\$300	\$300	-0-
	Data Mgt. and Reporting (1-Biologist for 3 man-days)	\$1,250	\$625	\$625
	Travel (Lodging when needed and per diem)	\$1,103	\$1,103	-0-
	<b>2010 Estimated Totals:</b>	<b>\$20,261</b>	<b>\$12,582</b>	<b>\$7,679</b>

**3.3.2 2011 Lake Chelan Tributaries Spawning Monitoring and Evaluation, USFS**

During the spawning season (April-June) Forest Service fish biologists will perform spawning ground surveys in the adfluvial zones of Prince, Fish, and Safety Harbor Creeks according to the methodology of the Lake Chelan Comprehensive Management Plan (Viola and Foster 2002) and snorkel surveys in the fall to document the presence/absence of rainbow trout and cutthroat trout young-of-year. Additionally, the mechanical treatment of the outlets of Gold and Mitchell creeks (completed in March 2011) will be periodically monitored.

**Estimated Budget and Schedule:**

Year	Task	Total \$	Requested \$	USFS Matching \$
2011 Apr-Jun	Install temperature data loggers and Conduct weekly spawning surveys at 3 tributary adfluvial zones. (GS11 Fish Bio and GS5 Fish Tech for 11 days)	\$2,700	\$1,350	\$1,350
Fall	Conduct snorkel surveys in 3 adfluvial tributary zones. (GS5 & GS11 Fish Bios for total of 4 crew-days)	\$1,000	\$500	\$500
Apr-Jul	USFS boat fuel	\$1,000	\$500	\$500
Apr-Jul	USFS boat driver	\$3025	\$1,512	\$1,512
Nov-Dec	Data Mgt. and Reporting (GS11 Fish Bio. for 5 person-days)	\$1,348	\$674	\$674
	<b>2010 Estimated Totals</b>	<b>\$9073</b>	<b>\$4,536</b>	<b>\$4,536</b>

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

Beginning in 2010 and continuing into 2011, and every third and fourth year thereafter, WDFW will sample First, 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. If time and man power allow all or some of the following additional seven creeks may also be sampled in 2010: Twenty-five

Mile, Pyramid, Graham Harbor, Coyote, Castle, Deep Harbor and Lone Fir creeks. If not, these creeks will be surveyed in 2011. This sequence of sampling effort will begin again in 2013 and continue into 2014 (see Section 2.2.2).

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

<b>Year</b>	<b>Task</b>	<b>Total \$</b>	<b>Requested \$</b>	<b>WDFW Matching \$</b>
<b>Fall 2010</b> (every 3 years)	Conduct estimates of juvenile cutthroat and rainbow trout abundance in seven selected tributaries (2 Scientific Technicians and 1 Biologist for a total of 42 man-days)	\$12,706	\$6,353	\$6,353
	Travel (Lodging when needed and per diem)	\$1,050	\$1,050	-0-
	Boat and Vehicle (0.5 months)	\$740	\$740	-0-
	Supplies and equipment	\$1,050	\$1,050	-0-
	Data Mgt. and Reporting (1-Biologist for 5 man-days)	\$1,156	\$578	\$578
	<b>2010 Estimated Totals:</b>	<b>\$16,702</b>	<b>\$9,771</b>	<b>\$6,931</b>

#### **3.3.4 Stehekin River Tributary/Side-Channel Cutthroat and Rainbow Trout Spawner Surveys, NPS**

Continue to monitor trends in abundance of cutthroat and rainbow trout spawners (May through June, 2011) at 12 index sites in the lower 8 to 10 miles of the Stehekin River. Results will be used to evaluate progress towards restoration of adfluvial/fluvial westslope cutthroat trout and management efforts directed at reduction of non-native rainbow trout in the lower 8 miles of the Stehekin River (see Section 2.2.3).

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

<b>Year</b>	<b>Task</b>	<b>Total \$</b>	<b>Requested \$</b>	<b>NPS Matching \$</b>
2011 (Annual)	Conduct 4 to 5 biweekly spawner surveys at all tributary index (1-GS/9 Ecologist and 1-GS/6 Bio Tech for total of 50 person-days)	\$10,675	\$10,675	-0-
	Travel (Ferry and per diem)	\$1700	\$1000	\$700
	Vehicle (1.25 months @ \$800/month)	\$1000	-0-	\$1000
	Supplies and equipment	\$700	-0-	\$700
	Data Mgt. and Reporting (1- GS9 Ecol. for 20 man-days, GS12 Ecol. -2 days)	\$6145	-0-	\$6145
	<b>2011 Estimated Totals:</b>	<b>\$20,220</b>	<b>\$11,675</b>	<b>\$8,545</b>

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

Despite the apparent lack of spawning cutthroat trout in Stehekin River tributary and side-channel index sites (Section 2.2.4), a number of large, 15"-18" cutthroat trout were viewed in the mainstem Stehekin River during the late fall and autumn 2010 kokanee surveys. Though not observed while spawning, these observations confirm the presence of large, potentially adfluvial cutthroat in the Stehekin River system. To compliment information collected from the tributary/side-channel spawner surveys, additional mainstem Stehekin River exploratory spring and fall snorkel surveys will be conducted in 2011 to assess progress towards restoration of adfluvial/fluvial westslope cutthroat trout

and management efforts directed at reduction of non-native rainbow trout. Two spring and one fall snorkel surveys will be conducted at four to six of the eight potential large pool/tail-out survey locations in the lower 7km of the Stehekin River mainstem. Numbers of rainbow and cutthroat trout spawners and holding fish (<6in, 6-12in, >12-18in, and >18in) will be recorded. All observed redds will also be recorded. Results will be used to evaluate and refine methods for monitoring recovery of westslope cutthroat trout in the Stehekin River.

**Estimated Budget and Schedule:**

Year	Task	Total \$	Requested \$	NPS Matching \$
2011	Conduct two spring snorkel surveys and one late September survey in 4-6 lower mainstem pools and tail-outs (1-GS/9 Ecologist and 1-GS/6 Bio Tech for total of 24 person-days)	\$5124	\$5124	-0-
	Travel (Ferry and per diem)	\$640	\$640	-0-
	Vehicle (0.25 months @ \$800/month)	\$200	-0-	\$200
	Supplies and equipment	\$400	-0-	\$400
	Data Mgt. and Reporting (1- GS9 Ecol. for 15 man-days, GS12 – 2 days)	\$4800	-0-	\$4800
	<b>2011 Estimated Totals:</b>	\$11,164	\$5764	\$5400

**3.3.6 Stehekin River Tributary/Side-Channel Juvenile Cutthroat and Rainbow Trout Surveys, NPS**

This is an exploratory survey (2011) designed to supplement information from the tributary and side-channel cutthroat and rainbow trout spawner surveys (Section 2.2.3). The 2009 and 2010 spawner surveys failed to confirm the presence of cutthroat in any of the spawner survey index reaches. Results from this study would be used to confirm the presence or absence of cutthroat trout in our spawner index reaches and provide baseline abundance information for future evaluations of cutthroat recovery in the lower Stehekin.

Relative abundance (electrofishing CPE) and distribution of juvenile cutthroat and rainbow trout will be documented in a representative sample of four to five of the spawner survey index reaches during late September. Non-lethal tissue samples will be collected for genetic analyses to verify species, separating cutthroat from rainbow trout and cutthroat x rainbow hybrids following methods in Ostberg and Rodriguez (2006). A single pooled sample of tissue from 50 fish will be evaluated for this analysis. Results of this study will be used to refine future monitoring efforts focused on evaluating progress towards recovery of cutthroat trout in the Stehekin River.

**Estimated Budget and Schedule:**

Year	Task	Total \$	Requested \$	NPS Matching \$
2011	Fish collection in 4 to 5 spawner survey index reaches during late September (1-GS/9 Ecologist and 1-GS/6 Bio Tech for total of 20 person-days).	\$4270	\$4270	-0-
	Travel (Ferry and per diem)	\$500	\$500	-0-
	Vehicle (0.25 months @ \$800/month)	\$200	-0-	\$200
	Supplies and equipment	\$800	-0-	\$800
	USGS –BRD Lab analyses, Data Mgt. and Reporting (50 samples @ \$40/sample including Overhead)	\$2000	\$2000	-0-
	Data Mgt. and Reporting (1- GS9 Ecol. for 15 man-days, GS12 Ecol. -2 days)	\$4800	-0-	\$4800
	<b>2011 Estimated Totals:</b>	\$12,570	\$6770	\$5800

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

Chelan PUD will conduct annual fall spawning surveys for kokanee and land-locked Chinook salmon in 2011, 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). Results of 2010 kokanee spawning surveys are contained in the [Lake Chelan Kokanee Spawning Ground Surveys, 2010 Final Report](http://www.chelanpud.org/departments/licensingCompliance/lc_implementation/ResourceDocuments/35980.pdf) at the following link: [http://www.chelanpud.org/departments/licensingCompliance/lc\\_implementation/ResourceDocuments/35980.pdf](http://www.chelanpud.org/departments/licensingCompliance/lc_implementation/ResourceDocuments/35980.pdf)

**Estimated Budget and Schedule:**

The cost of conducting kokanee spawning surveys in 2011 is estimated to be \$12,000. Weekly surveys will be conducted beginning in early September and continuing through mid-October or until the kokanee run ends. Surveys will be conducted in index reaches of Blackberry Creek and Company Creek, and from their mouth up to the first impassable barriers in Fish, Prince, Safety Harbor, First, and Twenty-five Mile creeks. One survey per season will be conducted in Mitchell, Gold, and Grade creeks. Kokanee spawning in these three creeks has been low to nonexistent in recent years.

**3.3.8 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.

**Summary of 2011 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)	\$20,262	\$12,583	\$7,679	Section 3.3.1
Lake Chelan Tributary Trout Spawning Surveys (USFS)	\$9,073	\$4,536	\$4,536	Section 3.3.2
Lake Chelan Tributary Estimates of Juvenile Cutthroat and Rainbow Trout Abundance (WDFW)	\$16,702	\$9,771	\$6,931	Section 3.3.3
Stehekin River Tributary/Side-Channel Cutthroat and Rainbow Trout Spawner Surveys (NPS)	\$20,220	\$11,675	NPS \$8,545	Section 3.3.4
Stehekin River Mainstem Cutthroat and Rainbow Trout Surveys (NPS)	\$11,164	\$5,764	NPS \$5,400	Section 3.3.5
Stehekin River Tributary/Side-Channel Juvenile Cutthroat and Rainbow Trout Surveys (NPS)	\$12,570	\$6,770	NPS \$5,800	Section 3.3.6
Fall Index Stream Kokanee Spawning Surveys (PUD)	\$12,000	\$12,000		Section 3.3.7
Kokanee Stocking Monitoring and Evaluation – Fin Clipping (WDFW)	\$6,200	\$6,200		Section 3.3.8
<b>Total M&amp;E Survey Costs</b>	\$108,190	\$69, 299	\$38,891	
Tributary Barriers			N/A	Section 3.1
Fish Stocking	\$30,000	\$30,000	N/A	Section 3.2
<b>TOTAL</b>	\$138, 190	\$99, 299	\$38,891	

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## Sokolowski, Rosana

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**From:** Osborn, Jeff  
**Sent:** Tuesday, November 08, 2011 12:08 PM  
**To:** Alex Martinez; Bitterman, Deborah; Bob Goedde; Bruce Heiner; Carl Merkle; Catherine Willard; Graham Simon; Hays, Steve; Hugh Anthony; Jeff Korth; Jerry Marco; Miller, Joseph; Nicky Markey; Osborn, Jeff; Pat Irle; Reed Glesne; Smith, Michelle; Steve Lewis; Truscott, Keith  
**Subject:** Lake Chelan Fishery Forum 2012 Annual Work Plan meeting

Dear Lake Chelan Fishery Forum: I propose that we gather the Forum to discuss development of the Lake Chelan Fishery Forum (LCFF) 2012 Annual Work Plan (AWP), based on several requests from LCFF participants. Hopefully, materials can be sent to Graham Simon, WDFW, for compilation into a first draft AWP that can be circulated prior to and discussed at the meeting. Following are some proposed dates and times for an all-day meeting to give us plenty of time to discuss and formulate the 2012 Work Plan:

Wednesday, December 14: 10:00am to 3:00pm;  
Thursday, December 15: 10:00am to 3:00pm;  
Tuesday, December 20: 10:00am to 3:00pm;  
Wednesday, December 21: 10:00am to 3:00pm.

Please let me know your preferred date and time at your earliest convenience, and I will send out an email verifying the date, time, and call-in information.

Thank you very much.

***Jeff Osborn***  
***License Program Coordinator***  
***Natural Resources Programs***  
***Public Utility District No. 1 of Chelan County***  
***327 North Wenatchee Avenue***  
***PO Box 1231***  
***Wenatchee, WA 98807-1231***  
***Phone: 509-661-4176***  
***FAX: 509-661-8203***  
***Email: [jeff.osborn@chelanpud.org](mailto:jeff.osborn@chelanpud.org)***

## Sokolowski, Rosana

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**From:** Osborn, Jeff  
**Sent:** Tuesday, November 15, 2011 10:55 AM  
**To:** Alex Martinez; Bitterman, Deborah; Bob Goedde; Bruce Heiner; Carl Merkle; Catherine Willard; Graham Simon; Hays, Steve; Hugh Anthony; Jeff Korth; Jerry Marco; Miller, Joseph; Nicky Markey; Osborn, Jeff; Pat Irle; Reed Glesne; Smith, Michelle; Steve Lewis; Truscott, Keith  
**Subject:** Lake Chelan Fishery Forum meeting - 2012 Annual Work Plan development

Dear Lake Chelan Fishery Forum: Based on your responses, Thursday, December 15 is the date most available for our fall Forum meeting. Let's plan to convene at 10:00 am at the PUD headquarters building, 1<sup>st</sup> floor large conference room. I have the conference room reserved from 10:00 am to 3:00 pm to give us plenty of time for discussions. Please enter the front lobby and sign in there. We will have folks there to escort you to the conference room. It would be ideal if everyone could submit their desired 2012 projects, budgets, and schedules to Graham Simon as soon as possible in order for us to have a draft to review on the 15<sup>th</sup>. We will have teleconferencing available if people wish to participate via phone. An agenda for the meeting will be forthcoming soon.

In addition to developing the 2012 Annual Work Plan, I would like to pose the following question to the LCFF for discussion at the meeting: "What are our goals and objectives for fishery management in Lake Chelan?" How's that for an easy one?! I have been asked that question on several occasions recently in meetings with public representatives, and I'd like to ensure my response to the question is consistent with the goals and objectives of the fishery and habitat management agencies.

We have some new members to the LCFF, so I am looking forward to getting us all together in December. AS always, please feel free to give me a call with any questions.

**Jeff Osborn**  
**License Program Coordinator**  
**Natural Resources Programs**  
**Public Utility District No. 1 of Chelan County**  
**327 North Wenatchee Avenue**  
**PO Box 1231**  
**Wenatchee, WA 98807-1231**  
**Phone: 509-661-4176**  
**FAX: 509-661-8203**  
**Email: [jeff.osborn@chelanpud.org](mailto:jeff.osborn@chelanpud.org)**

## Sokolowski, Rosana

---

**Subject:** FW: LCFF Annual Work Plan  
**Attachments:** LCFF 2012 Work Plan Final Draft WDFW.docx

-----Original Message-----

From: Simon, Graham A (DFW) [<mailto:Graham.Simon@dfw.wa.gov>]  
Sent: Tuesday, January 10, 2012 1:01 PM  
To: Osborn, Jeff  
Cc: Nelson, Travis W (DFW); Robison, Douglas L (DFW)  
Subject: RE: LCFF Annual Work Plan

Jeff - Here is the Draft 2012 AWP that needs to be circulated to the LCFF members once the Kokanee spawning ground survey section is updated on your end and thanks for offering to update that. I left the sections needing your review highlighted in red. Once you get the sections updated if you want to send the work plan back I can proof it a bit and get any format issues cleaned up before we send it out to the forum or just send the draft out and everyone can send their edits to me and I will fix the formatting if needed at that time. Whatever is easiest on your end just let me know.

Travis Maitland is out on sick leave and I need to have his feedback on the Kokanee creel work proposed for 2012 but that can take place once we circulate the draft. Glad we knocked this out early this year. Give me a call if you have questions

Graham

-----Original Message-----

From: Osborn, Jeff [<mailto:Jeff.Osborn@chelanpud.org>]  
Sent: Monday, January 09, 2012 8:42 AM  
To: Simon, Graham A (DFW)  
Cc: Nelson, Travis W (DFW); Robison, Douglas L (DFW); [catherine.willard@usda.gov](mailto:catherine.willard@usda.gov); Glesne Reed ([reed\\_glesne@nps.gov](mailto:reed_glesne@nps.gov))  
Subject: RE: LCFF Annual Work Plan

Graham: Sounds great that the plan is coming together. To make your life easier, why don't we plan that I update the kokanee spawning ground survey section as soon as the draft is complete and then distribute the draft to the Forum. Sound good to you?

Jeff Osborn  
License Program Coordinator  
Natural Resources Programs  
Public Utility District No. 1 of Chelan County  
327 North Wenatchee Avenue  
PO Box 1231  
Wenatchee, WA 98807-1231  
Phone: 509-661-4176  
FAX: 509-661-8203  
Email: [jeff.osborn@chelanpud.org](mailto:jeff.osborn@chelanpud.org)

-----Original Message-----

From: Simon, Graham A (DFW) [<mailto:Graham.Simon@dfw.wa.gov>]  
Sent: Friday, January 06, 2012 6:48 PM  
To: Osborn, Jeff

Cc: Nelson, Travis W (DFW); Robison, Douglas L (DFW); [catherine.willard@usda.gov](mailto:catherine.willard@usda.gov); Glesne Reed ([reed\\_glesne@nps.gov](mailto:reed_glesne@nps.gov))  
Subject: FW: LCFF Annual Work Plan

Jeff - I wanted to let you know the LCFF 2012 AWP is complete except for one section. Im waiting to hear back from Cory Morrison (wdfw) at the Chelan Hatchery who will have the numbers for 2011 actual stoking rates (table 8) and what tributaries were stocked to me by Monday. Art explained that the he had retired and the Chelan Hatchery staff took over to complete the 2011 stocking.

Also I need to chat with you a bit about the fall index Kokanee spawning surveys that the PUD conducted to see if there are additional changes to that section of the plan.

I will give you a call Monday to discuss the next steps for circulation of the draft plan to the LCFF members

Graham

---

From: Simon, Graham A (DFW)  
Sent: Wednesday, December 21, 2011 7:52 AM  
To: Maitland, Travis W (DFW); [artviolal1@yahoo.com](mailto:artviolal1@yahoo.com); [catherine.willard@usda.gov](mailto:catherine.willard@usda.gov); [Reed\\_Glesne@nps.gov](mailto:Reed_Glesne@nps.gov) ; [hugh\\_anthony@nps.gov](mailto:hugh_anthony@nps.gov); [ashley\\_rawhouser@nps.gov](mailto:ashley_rawhouser@nps.gov)  
Cc: Robison, Douglas L (DFW); [jeff.osborn@chelanpud.org](mailto:jeff.osborn@chelanpud.org)  
Subject: LCFF Annual Work Plan

Everyone - It was nice meeting with you and going over the Lake Chelan Annual Work Plan for 2012. I just wanted to make sure everyone at the meeting had my contact information to send their final updates to so I can incorporate them in to the final draft and send that off to Jeff in early 2012.

Hope all is well and Happy Holidays

Graham Simon  
Habitat Biologist  
Renewable Energy Section  
WDFW Region 2  
3860 Chelan Hwy N.  
Wenatchee, WA 98801  
509-662-0503 desk  
509-670-0742 cell  
509-662-0492 fax

# **LAKE CHELAN FISHERY FORUM 2012 ANNUAL WORK PLAN**

**LICENSE ARTICLE 404  
SETTLEMENT AGREEMENT CHAPTER 6**

**FINAL**

**January 9, 2012**

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 Settlement Agreement (SA) and Lake Chelan Fishery Plan is for the National Park Service (NPS), USDA Forest Service, 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 2012 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 West Slope cutthroat, 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 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 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 2010 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 until mid October. 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.

## **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 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 150-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, and 2011 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 1 and 2. Additional summary information can be found in Lake Chelan Cutthroat Trout Spawning Ground Surveys 2009 (Johnson and Archibald 2009).

Table 1. 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 2. Snorkel Survey Results for four North Shore Lake Chelan Tributaries, 2009.

Tributary	Survey Dates	Lake Chelan	Survey Reach	Fish Species	Length of Fish (cm)			
					<3	3-10	10-20	20-30

		level (ft. msl)	Length (m)					
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 3. 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 4. 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 5. 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 6. 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.

### 2.2.2 Lake Chelan Tributary Estimates of Juvenile Cutthroat and Rainbow Trout Abundance, WDFW

Beginning in 2011 and continuing into 2012, and every third and fourth year thereafter, WDFW will sample First, 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. If time and manpower allow all or some of the following additional seven creeks may also be sampled in 2012: Gold, Prince, Railroad, Fish, Pyramid and Four Mile. If not, these creeks will be surveyed in 2013. This sequence of sampling effort will begin again in 2013 and continue into 2014.

Electrofishing techniques similar to those described in Brown (1984) and DES (2000a) will be used to sample tributary abundance of juvenile WSCT and RBT. Results from data gathered will be compared to those conducted by Brown (1984) and DES (2000a) to estimate population dynamics of WSCT since year 2000; the intent being to evaluate the effectiveness of recent management actions to increase WSCT abundance.

Table 7. Estimated 2011 Lake Chelan Tributary Rainbow Trout Species Composition, Density and Population Abundance.

<b>Rainbow</b>						
<b>Tributary</b>	<b>Site estimates</b>		<b>Sample site Area (M<sup>2</sup>)</b>	<b>All Rainbow per (M<sup>2</sup>)</b>	<b>Available<sup>2</sup></b>	<b>Rainbow Population Estimate</b>
	<b>All RB</b>	<b>YOY<sup>a</sup></b>			<b>Habitat Area (M<sup>2</sup>)</b>	
<b>First Creek</b>	16 (16.0-16.6) <sup>c</sup>	11 (11.0-11.9)	82.3	0.19	6,208	1,207
<b>Twenty Five Mile Creek</b>	31 (28.0- 38.5)	25 (25.0 27.3)	147.5	0.21	12,288	2,583
<b>Mitchell Creek</b>	13 (13.0-13.2)	10 (10-10.2)	51.4	0.25	1,686	426
<b>Grade Creek</b>	15 (15.0-15.6)	4 (4.0-4.7)	73.9	0.20	1,168	237
<b>Safety Harbor Creek</b>	31 (31.0-31.8)	8 (8.0-9.0)	259.9	0.12	1,356	162

Table 8. Estimated 2011 Lake Chelan Tributary Cutthroat Trout Species Composition, Density and Population Abundance.

<b>Cutthroat</b>						
<b>Tributary</b>	<b>Site estimates</b>	<b>YOY</b>	<b>Sample site Area (M<sup>2</sup>)</b>	<b>All Cutthroat per (M<sup>2</sup>)</b>	<b>Available Habitat Area (M<sup>2</sup>)</b>	<b>Cutthroat Population Estimate</b>
<b>First Creek</b>	10 (8.0-20.7)	3 (3.0-6.1)	82.3	0.12	6,208	754
<b>Twenty Five Mile Creek</b>	0 (---)	0 (---)	147.5	0	12,288	0
<b>Mitchell Creek</b>	1 (---)	0 (---)	51.4	0.02	1,686	33
<b>Grade Creek</b>	0 (---)	0 (---)	73.9	0	1,168	0
<b>Safety Harbor Creek</b>	14 (13.0-14.7)	0 (---)	259.9	0.05	1,356	73

Table 9. Estimated 2011 Lake Chelan Tributary Total of All Rainbow & Cutthroat Trout Species Composition, Density and Population Abundance.

<b>Total of All Rainbow &amp; Cutthroat Trout</b>	
<b>Tributary</b>	<b>Estimate</b>
First Creek	1,961
Twenty Five Mile Creek	2,583

Mitchell Creek	459
Grade Creek	237
Safety Harbor Creek	235

**2.2.3. Stehekin River Tributary/Side-Channel Cutthroat and Rainbow Trout Spawner Surveys, NPS**

Rainbow trout and cutthroat trout spawner surveys, in selected Stehekin River side-channels and tributary index reaches, were initiated by NPS staff in 2009 in order to evaluate progress towards restoration of adfluvial westslope cutthroat trout. The objective was to annually monitor trends in abundance of cutthroat and rainbow trout spawners (April 15- June 30) at 12 tributary and side-channel index reaches in the lower 8 miles of the Stehekin River.

During 2009, initial habitat surveys (Anthony and Glesne 2010) of all side-channels and tributaries of the lower 8 miles of the Stehekin River were conducted for the purpose of selecting cutthroat and rainbow trout spawner 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.

During 2009 and 2010, four rainbow and cutthroat trout spawning surveys were conducted between mid-April and late June (Anthony and Glesne 2010, Anthony 2011, in prep.). During 2009, fish were observed at 5 of the 12 index reaches. Cutthroat trout were not observed during any of the surveys. A total of 11 adult rainbow trout and one unidentified fish were observed during the four surveys. Thirteen redds were observed in the 4 index reaches and two of these had rainbow trout spawners holding over them. During 2010, a total of 9 fish were observed at 6 of the 12 index reaches and as in 2009 they were all rainbow trout. Nine unknown redds were also observed at one of the index reaches in 2010.

Index stream spawner surveys were again repeated during 2011. Three surveys were conducted between April 26<sup>th</sup> and June 29<sup>th</sup>. As in 2009 and 2010, there were no cutthroat spawners observed in any of the index reach surveys. Seven rainbow trout spawners, four rainbow trout redds, and 14 unknown redds were observed in the index reaches.

Due to the absence of cutthroat spawners in any of the 2009-2011 surveys it is recommended that they be discontinued in 2012. Experimental stocking of cutthroat fry is currently recommended for a limited number of index reaches. Spawner surveys should be reinstated in 2016 to evaluate any improvements resulting from supplemental stocking and/or natural recruitment. In the interim period efforts to evaluate adfluvial cutthroat trout 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 is nearly completed (Anthony and Glesne 2012; currently in peer review).

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

Despite the apparent lack of spawning cutthroat trout in Stehekin River tributary and side-channel index sites (Section 2.2.3.), a number of large (380-460 mm) cutthroat trout were viewed in the mainstem Stehekin River during the late fall and autumn 2010 kokanee surveys. Though not observed while spawning, these observations confirm the presence of large, potentially adfluvial cutthroat in the Stehekin River system. In light of these observations it was decided to increase our survey efforts in 2011 to include snorkeling mainstem pools. Eight large channel spanning pools were identified in the lower 7 km of the mainstem Stehekin River. Snorkel surveys of these eight pools were completed once in the early spring, and six of the eight pools were surveyed twice in the late summer during periods of low river discharge and good underwater visibility. The two pools that were not surveyed in the latter surveys were determined to be poor candidate sites for long term monitoring due to flow and habitat conditions.

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. Adfluvial size cutthroat trout ( $\geq 300$  mm) were observed in four of the eight pools surveyed on five occasions between April 27<sup>th</sup> and August 30<sup>th</sup>. Adfluvial size rainbow trout were observed in all eight pools surveyed on 14 occasions during the same time period. Both rainbow and cutthroat trout were most abundant during the April 27<sup>th</sup> sampling date, coinciding with spring spawning.

Four of the eight pools surveyed in 2011 were selected for continuing surveys in 2012. Pool selection was based on documented cutthroat trout presence and safety of conducting snorkel surveys within the pool. A report including methods, results, and pool location maps will be completed by April 2012.

#### ***2.2.5 Stehekin River Tributary and Side-Channel Summer Cutthroat and Rainbow Trout Surveys, NPS***

The 2009-2011 spawner surveys failed to confirm the presence of cutthroat in any of the spawner survey index reaches. As a result, exploratory fish surveys focused on documenting summer and fall abundance of cutthroat and rainbow trout in side-channel and tributary habitat were implemented in 2011. Surveys were conducted during late July, late August, and early September of 2011. Visual observations and snorkel surveys were used to document species presence and their abundance at 11 of the 12 spawner survey index reaches (Section 2.2.3) during late July and 10 of the index reaches in late August. Cutthroat trout were not observed at any of the index reaches during the late July survey and only two adfluvial size rainbows ( $\geq 300$  mm) and one sub-adult rainbow trout were observed. During the late August survey, a total of eight adfluvial cutthroat trout

were observed in five of the index reaches. Juvenile cutthroat trout were not observed during this survey. Juvenile and sub-adult rainbow trout (<300 mm) were abundant and observed in all of the 10 index reaches surveyed however, adfluvial size rainbow trout were not observed in the late August survey.

The main objective of the September, 10-12 sampling period was to collect young-of-year fish for genetic analysis to provide definitive species information needed to verify successful spawning of cutthroat trout in four of the spawner survey index reaches. Species composition of these samples will also be useful in determining the frequency of rainbow and cutthroat 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 (two in Blackberry Creek and two in Company Creek). Genetic analyses of these 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, 2012. Additional young-of-year samples should be collected from other spawner index reaches in 2012.

In addition to young-of-year sampling, observations and angling were used to document the presence of adfluvial cutthroat and rainbow trout during the September survey. A total of seven cutthroat trout and one rainbow x cutthroat hybrid, all ranging in size from 380-430 mm, were observed during the survey. Tissue samples for genetic analysis were collected from three of these fish caught by angling. Because of these notable observations, increased effort to monitor adfluvial fish in side-channels during the late summer and fall is recommended for 2012.

#### ***2.2.6 Monitor Frequency of Non-Native Rainbow Genetic Introgression in Native 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 rainbow trout and native cutthroat trout. Sites were selected to represent the gradient of introgression ranging from pure cutthroat trout to a mixture of pure fish, F1 and post-F1 hybrids to mostly pure rainbow trout as previously documented in the Ostberg and Rodriguez (2006) publication. Sampling locations corresponded to reach numbers designated in Ostberg and Rodriguez (2006; representing samples collected between 1999 and 2003) publication (below and in Figure 1). Non-lethal tissue samples were collected from 48-50 fish from all of the locations listed below except Location 7, where 24 samples were collected.

- Location 1 (upper Stehekin; SR6)
- Location 2 (Stehekin River above Bridge Creek confluence; SR4)
- Location 3 (Bridge Creek between McAlester and South Fork tribs; BR5)
- Location 4 (Bridge Creek near confluence with Stehekin; BR1)
- Location 5 (North Fork of Bridge Creek; NF)
- Location 6 (Stehekin River below Bridge Creek confluence; SR1 and SR2)
- Location 7 (lower Stehekin River below confluence of Agnes Creek; previously unsampled)

Laboratory analyses have been completed (USGS-WFRC, Seattle) and a draft journal submission is currently in peer review. Tentative results provided by Carl Ostberg indicate that there has not been any significant change in the frequency of westslope cutthroat, rainbow trout, and hybrids between the two time periods at any of the locations sampled. The 24 samples taken from the new location in the lower Stehekin below Agnes Creek confluence resulted in mostly rainbow trout as expected (22 rainbow and 2 hybrids).

**(b) Genetic Introgression in Cutthroat Trout**

(Ostberg and Rodriguez 2006)

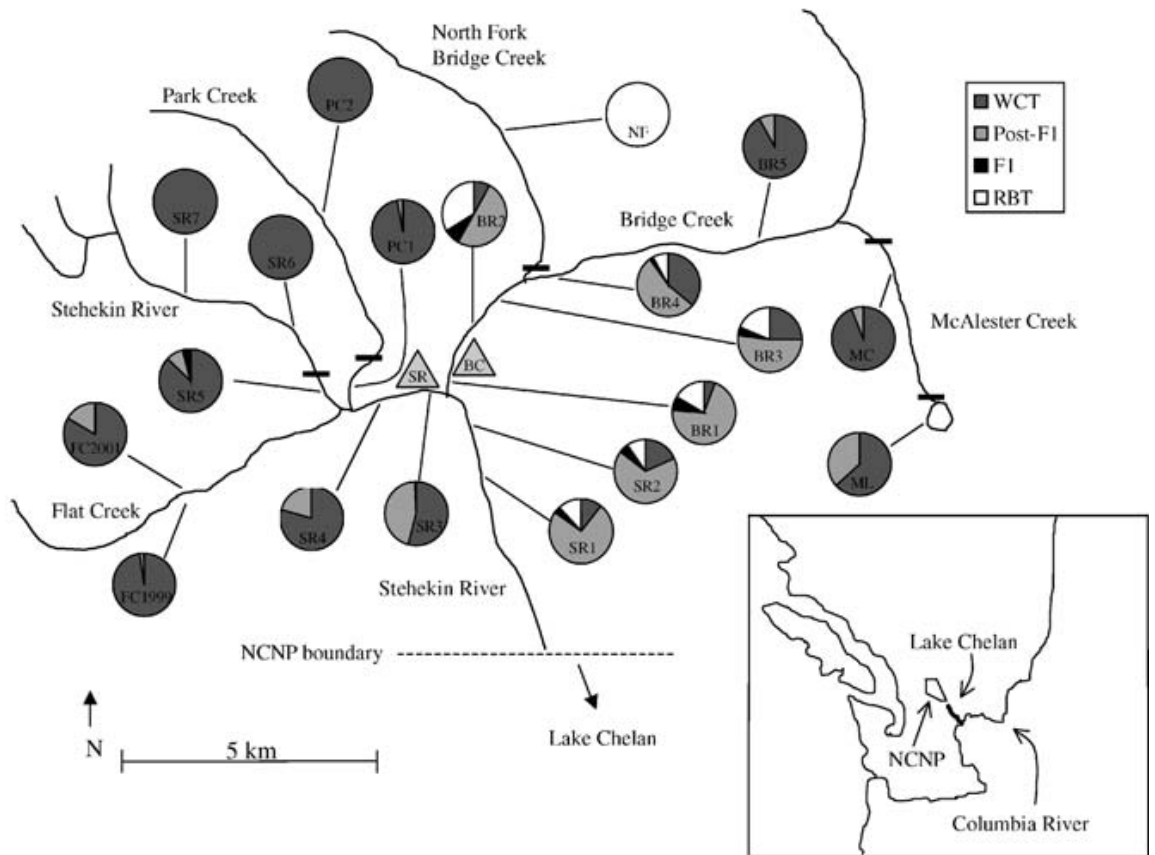


Figure 1. Genetic introgression in cutthroat trout collected between 1999 and 2003 in the Stehekin River Basin.

It is recommended that we continue to monitor cutthroat introgression every five to ten years to evaluate cutthroat trout status and progress towards cutthroat trout 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

maintain this, 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. 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.

### ***2.3.2 Mainstem Stehekin River and Tributary/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 side-channels/tributaries in the lower 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 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/tributary 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/tributary habitat was determined using the Area Under the Curve Method (AUC: Beidler and Nickelson 1980). Tentative results show a total of 50,580 kokanee using the mainstem Stehekin channel and 131,568 kokanee using the side-channel/tributary habitat. Total kokanee spawner escapement was estimated at 182,148 fish. A detailed report will be nearly completed by NPS-NOCA staff and should be available by May 2012.

Replication of this survey is recommended at three to five year intervals. Results can 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 \$5,000 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, 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.



### **SECTION 3: MEASURES TO BE IMPLEMENTED IN 2012**

The following addresses Tributary Barriers, Fish Stocking, and the Monitoring and Evaluation Program measures that will be implemented in 2012.

#### **3.1 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 effect 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](http://www.chelanpud.org/lc-Resource-Documents-LCFF)):

**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 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.
3. 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.
4. 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.

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

**ADD BARRIER REMOVAL TECHNIQUES HERE FOR 2011 IF ANYTHING WAS COMPLETED**

**3.2 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)).

In 2009, WDFW released approximately 50,000 WSCT (at a size of 15 fish/pound) at Lakeside and Mill Bay in March, and approximately 70,000 triploid RBT (at a size of 3 fish/pound) at Lakeside in August and September (Art Viola, WDFW, pers. com.). Approximately 227,000 kokanee fingerlings, taken from broodstock collected in fall 2006 from the Stehekin River, were released into Lake Chelan near the Yacht Club in May (at a size of 75 fish/lb.). Additionally, approximately 175,000 WSCT fry were released into Twenty-five Mile, Mitchell, Prince, Safety Harbor, Fish, Grade, and First creeks (at a size of 600 fish/lb.) in June and July.

The stocking plan from WDFW for 2010 is shown in Table 5 (Art Viola, WDFW, pers. com.).

**Table 5. 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	summer	50,000	Fry	March

	Chinook <sup>1</sup>				
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1 – The triploid Chinook program is not funded by Chelan PUD

The actual number of fish released by WDFW into Lake Chelan in 2010 is presented in Table 6 (Corey Morrison, WDFW, pers. com.).

**Table 6. 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 7 below (Corey Morrison, WDFW, pers. com.).

**Table 7. 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

The actual number of fish released by WDFW into Lake Chelan in 2011 is presented in Table 8 (Corey Morrison, WDFW, pers. com.).

**Table 8. 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
	Cutthroat	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 program is not funded by Chelan PUD

The stocking plan from WDFW for 2012 is shown in Table 9 below (Corey Morrison, WDFW, pers. com.).

**Table 9. 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	Spokane	1,000	0.5	May - September

	Rainbow				
	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

### **3.3 Monitoring and Evaluation Program**

#### **3.3.1 Comprehensive Creel Surveys, WDFW**

Comprehensive creel surveys will be conducted beginning in 2010. Surveys are designed to: 1) monitor the contribution (*naturally produced or hatchery released*) of Westslope cutthroat, 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. The next Comprehensive Creel Survey will be completed in 2013.

#### **Estimated Budget and Schedule: No funds requested for 2012**

#### **3.3.2 2012 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 westlope 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 \$ LC06b2</b>	<b>USFS Matching \$</b>
2012 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>2012 Estimated Totals</b>	<b>\$8,790</b>	<b>\$1,000</b>	<b>\$3,895</b>	<b>\$3,895</b>

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

Beginning in 2011 and continuing into 2012, and every third and fourth year thereafter, WDFW will sample First, 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. If time and manpower allow all or some of the following additional seven creeks may also be sampled in 2012: Gold, Prince, Railroad, Fish, Pyramid and Four Mile. If not, these creeks will be surveyed in 2013. This sequence of sampling effort will begin again in 2013 and continue into 2014. (see Section 2.2.2).

**Estimated WDFW Budget and Schedule:**

Year	Task	Total \$	Requested \$ (LC06b1)	Requested \$ LC06b2	WDFW Matching \$
2012	Salaries	\$13,087.18		\$6,543.59	\$6,543.59
2012	Benefits	\$1,327.84		\$663.92	\$663.92
2012	Goods and Services	\$381.10	\$381.10		
2012	Travel	\$1,081.50	\$1,081.50		
2012	Total Direct Costs	\$15,877.62	\$1,462.60	\$7,207.51	\$7,207.51
2012	WDFW overhead @23.51%	\$3,732.84	\$343.86	\$1,694.49	\$1,694.49
	<b>2012 Estimated Totals</b>	<b>\$19,610.46</b>	<b>1,806.46</b>	<b>\$8,902.00</b>	<b>\$8,902.00</b>

**3.3.4 Stehekin River Tributary/Side-Channel Cutthroat and Rainbow Trout Spawner Surveys, NPS**

Due to the absence of cutthroat spawners in any of the 2009-2011 surveys it is recommended that they be discontinued in 2012 (see Section 2.2.3). Experimental stocking of cutthroat fry is currently recommended for sections of the Company and Blackberry Creek side-channels containing suitable rearing habitat and that also include four of the spawning survey index reaches.

A total of 78,750 cutthroat fry will be stocked in the Company Creek side-channel (2.5 km, 17,500 m<sup>2</sup> surface area) and 81,900 cutthroat fry in the Blackberry Creek side-channel (1.4 km, 18,200 m<sup>2</sup> surface area). Both channels have an average depth of approximately 0.5 m. Spawner surveys should be reinstated in 2016 to evaluate any improvements resulting from supplemental stocking and/or natural recruitment.



**Estimated Budget and Schedule: No funds requested for 2012**

**3.3.5 Stehekin River Mainstem Cutthroat and Rainbow Trout Surveys, NPS**

Despite the apparent lack of spawning cutthroat trout in Stehekin River tributary and side-channel index sites (Section 2.2.3), a number of large, 380-460 mm, cutthroat trout were viewed in the mainstem Stehekin River during the late fall and autumn 2010 confirming the presence of large, potentially adfluvial cutthroat in the Stehekin River system.

Lower mainstem Stehekin River exploratory spring and fall snorkel surveys of pool/tail-out habitat were conducted in 2011. The objectives of these surveys were to gain a better understanding of adfluvial cutthroat trout 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 rainbow trout. Results provided additional confirmation of large adfluvial cutthroat trout use in the mainstem Stehekin River and recommendations were made to continue snorkel surveys at four of the index pools during successive years (see Section 2.2.4). In addition, it is recommended that exploratory snorkel surveys of depositional zone riffle habitat be conducted in the lower 10 km of the mainstem in order to expand data collection efforts to all potential habitat utilized by adfluvial cutthroat trout in the mainstem.

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

**Estimated Budget and Schedule:**

<b>Year</b>	<b>Task</b>	<b>Total \$</b>	<b>NPS Requested \$ (LC b1)</b>	<b>NPS Matching \$</b>	<b>Requested PUD Matching \$ (LC b2)</b>
2012 Apr-Sept	Conduct one spring snorkel survey and two Aug/Sept surveys in 4 lower mainstem pools (1-GS/9 Ecologist and 1-GS/6 Bio Tech for total of 12 person-days)	\$2963	\$1035	\$964	\$964
Apr-Sept	Conduct one spring and one fall snorkel survey of mainstem	\$3950		\$1975	\$1975



	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 16 person-days)				
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)	\$5068		\$2534	\$2534
	<b>2012 Estimated Totals:</b>	\$13,481	\$2535	\$5473	\$5473

**3.3.6 Stehekin River Tributary/Side-Channel Summer Cutthroat and Rainbow Trout Surveys, NPS**

Exploratory surveys designed to supplement information from the tributary and side-channel cutthroat and rainbow trout spawner surveys were conducted at spawner index reaches in July and August of 2011. Another survey was conducted in September, but was limited to only four spawner index reaches located in the Blackberry and Company Creek side-channels. Young-of-year cutthroat and rainbow were collected at these four index reaches for genetic analysis to provide definitive species information needed to verify successful spawning of cutthroat trout. In addition, observations and angling at these four sites revealed the presence of a significant number of large adfluvial cutthroat trout which likely moved into these side-channels to feed on kokanee eggs (see Section 2.2.5).

Plans for 2012 include conducting snorkel and visual observation surveys during August and September to determine abundance and distribution of adfluvial cutthroat and rainbow trout at all of the tributary/side-channel spawner index reaches. Juvenile cutthroat and rainbow trout abundance and other species abundance information will also be collected during these surveys. Collection of young-of-year samples for genetic species verification will be completed at three more spawner index reaches. 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 \$ (LC b1)	NPS Matching \$	Requested PUD Matching \$
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					<b>(LC_b2)</b>
2012 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)	\$3950	\$1380	\$1285	\$1285
Aug- Sept	Collect cutthroat/rainbow young-of-year for genetic analysis in three previously unsampled spawner index reaches (1-GS/9 Ecologist and 1-GS/6 Bio Tech for total of 8 person-days)	\$1976	\$690	\$643	\$643
Oct- Dec	USGS –BRD Lab analyses, Data Mgt. and Reporting (75 samples @ \$40/sample including Overhead)	\$3000	\$1000	\$1000	\$1000
Aug- Sept	Travel (Ferry and per diem)	\$520	\$520		
Aug- Sept	Vehicle (0.25 months @ \$800/month)	\$200		\$200	0
Aug- Sept	Supplies	\$300		\$300	0
Nov- Dec	Data Mgt. and Reporting (1- GS9 Ecol. for 12 days, GS12 Ecol. – 3 days)	\$5068		\$2534	\$2534
	<b>2012 Estimated Totals:</b>	\$15014	\$3590	\$5962	\$5462

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

Chelan PUD will conduct annual fall spawning surveys for kokanee and land-locked Chinook salmon in 2011, 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). Results of 2010 kokanee spawning surveys are contained in the [Lake Chelan Kokanee Spawning Ground Surveys, 2010 Final Report](http://www.chelanpud.org/departments/licensingCompliance/lc_implementation/Resources/eDocuments/35980.pdf) at the following link: [http://www.chelanpud.org/departments/licensingCompliance/lc\\_implementation/Resources/eDocuments/35980.pdf](http://www.chelanpud.org/departments/licensingCompliance/lc_implementation/Resources/eDocuments/35980.pdf)

**Estimated Budget and Schedule:**

The cost of conducting kokanee spawning surveys in 2011 is estimated to be \$12,000. Weekly surveys will be conducted beginning in early September and continuing through mid-October or until the kokanee run ends. Surveys will be conducted in index reaches of Blackberry Creek and Company Creek, and from their mouth up to the first impassable barriers in Fish, Prince, Safety Harbor, First, and Twenty-five Mile creeks. One survey per season will be conducted in Mitchell, Gold, and Grade creeks. Kokanee spawning in these three creeks has been low to nonexistent in recent years.

**3.3.8 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 fish species and origin (naturally produced or hatchery released) contributing to the sport fishery; and 2) determine what species of fish anglers prefer to catch.

Year	Task	Total \$	Requested \$ (LC06b1)	Requested \$ LC06b2	WDFW Matching \$
2012	Salaries	\$4,808.04		\$2,404.02	\$2,404.02
2012	Benefits	\$1,103.28		\$551.64	\$551.64
2012	Goods & Services	\$901.25	\$901.25		
2012	Travel	\$568.05	\$568.05		
2012	WDFW overhead @23.51%	\$1,735.19	\$345.43	\$694.88	\$694.88
	<b>2012 Estimated Totals</b>	<b>\$9115.81</b>	<b>\$1,814.73</b>	<b>\$3,650.72</b>	<b>\$3,650.72</b>

**3.3.9 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.

**Summary of 2012 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)	\$0	\$0	WDFW \$0	Section 3.3.1
Lake Chelan Tributary Trout Spawning Surveys (USFS)	\$8,790	\$4,895	\$3,895	Section 3.3.2
Lake Chelan Tributary Estimates of Juvenile Cutthroat and Rainbow Trout Abundance (WDFW)	\$19,610.46	\$10,708.46	\$8,902	Section 3.3.3
Stehekin River Tributary/Side-Channel Cutthroat and Rainbow Trout Spawner Surveys (NPS)	\$0	\$0	NPS \$0	Section 3.3.4
Stehekin River Mainstem Cutthroat and Rainbow Trout Surveys (NPS)	\$13,481	\$8,008	NPS \$5,473	Section 3.3.5
Stehekin River Tributary/Side-Channel Juvenile Summer Cutthroat and Rainbow Trout Surveys (NPS)	\$15,014	\$9,052	NPS \$5,962	Section 3.3.6
Fall Index Stream Kokanee Spawning Surveys (PUD)	\$12,000	\$12,000		Section 3.3.7
Kokanee Stocking Monitoring and Evaluation – Fin Clipping (WDFW)	\$6,200	\$6,200		Section 3.3.8
Kokanee Creel Survey (WDFW)	\$9115.81	\$5465.45	\$3,650.72	Section 3.3.9
<b>Total M&amp;E Survey Costs</b>	\$??????	\$??????	\$??????	
Tributary Barriers			N/A	Section 3.1
Fish Stocking	\$30,000	\$30,000	N/A	Section 3.2
<b>TOTAL</b>	\$??????	\$??????	\$??????	

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## Sokolowski, Rosana

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**From:** Osborn, Jeff  
**Sent:** Friday, January 20, 2012 3:05 PM  
**To:** Alex Martinez; Bitterman, Deborah; Bob Goedde; Bruce Heiner; Carl Merkle; Catherine Willard; Graham Simon; Hays, Steve; Hugh Anthony; Jeff Korth; Jerry Marco; Miller, Joseph; Nicky Markey; Osborn, Jeff; Pat Irle; Reed Glesne; Smith, Michelle; Steve Lewis; Travis Maitland; Truscott, Keith  
**Subject:** Draft Final Lake Chelan Fishery Forum 2012 Annual Work Plan  
**Attachments:** LCFF 2012 Work Plan Final Draft WDFW jgo edits.docx

Dear Lake Chelan Fishery Forum: Attached is the draft final Lake Chelan Fishery Forum 2012 Annual Work Plan. I have edited the sections for which the PUD is responsible and revised a few minor formatting issues. I could use your help as follows:

1. Review carefully to make sure all your input is as it should be;
2. Remove the (b) from the genetic introgression figure on page 12 (I couldn't figure out how to edit the figure.);
3. Reed/Hugh, please update a citation on page 30; and
4. Provide any edits back to me by January 31 and I will finalize the document as of February 1, 2012.

Sound good to everyone? Special thanks to Graham Simon for his inauguration into the LCFF, and to all the leads for the agencies getting the information to Graham in a timely manner. I think it is a very good plan and am looking forward to implementation in 2012.

Thank you all very much.

**Jeff Osborn**  
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# LAKE CHELAN FISHERY FORUM 2012 ANNUAL WORK PLAN

LICENSE ARTICLE 404  
SETTLEMENT AGREEMENT CHAPTER 6

**DRAFT FINAL**

January ~~20~~, 2012

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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 Settlement Agreement (SA) and Lake Chelan Fishery Plan is for the National Park Service (NPS), USDA Forest Service, 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 2012 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 West Slope cutthroat, 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 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 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 2010 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 until mid October. 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.

## **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 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 150-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, and 2011 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 1 and 2. Additional summary information can be found in Lake Chelan Cutthroat Trout Spawning Ground Surveys 2009 (Johnson and Archibald 2009).

Table 1. 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 2. 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 3. 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 4. 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 5. 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

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Table 6. 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.

### 2.2.2 Lake Chelan Tributary Estimates of Juvenile Cutthroat and Rainbow Trout Abundance, WDFW

Beginning in 2011 and continuing into 2012, and every third and fourth year thereafter, WDFW will sample First, 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. If time and manpower allow all or some of the following additional seven creeks may also be sampled in 2012: Gold, Prince, Railroad, Fish, Pyramid and Four Mile. If not, these creeks will be surveyed in 2013. This sequence of sampling effort will begin again in 2013 and continue into 2014.

Electrofishing techniques similar to those described in Brown (1984) and DES (2000a) will be used to sample tributary abundance of juvenile WSCT and RBT. Results from data gathered will be compared to those conducted by Brown (1984) and DES (2000a) to estimate population dynamics of WSCT since year 2000; the intent being to evaluate the effectiveness of recent management actions to increase WSCT abundance.

Table 7. Estimated 2011 Lake Chelan Tributary Rainbow Trout Species Composition, Density and Population Abundance.

<b>Rainbow</b>						
<b>Tributary</b>	<b>Site estimates</b>		<b>Sample site Area (M<sup>2</sup>)</b>	<b>All Rainbow per (M<sup>2</sup>)</b>	<b>Available <sup>2</sup> Habitat Area (M<sup>2</sup>)</b>	<b>Rainbow Population Estimate</b>
	<b>All RB</b>	<b>YOY<sup>a</sup></b>				
<b>First Creek</b>	16 (16.0-16.6) <sup>c</sup>	11 (11.0-11.9)	82.3	0.19	6,208	1,207
<b>Twenty Five Mile Creek</b>	31 (28.0- 38.5)	25 (25.0-27.3)	147.5	0.21	12,288	2,583
<b>Mitchell Creek</b>	13 (13.0-13.2)	10 (10-10.2)	51.4	0.25	1,686	426
<b>Grade Creek</b>	15 (15.0-15.6)	4 (4.0-4.7)	73.9	0.20	1,168	237
<b>Safety Harbor Creek</b>	31 (31.0-31.8)	8 (8.0-9.0)	259.9	0.12	1,356	162

Table 8. Estimated 2011 Lake Chelan Tributary Cutthroat Trout Species Composition, Density and Population Abundance.

<b>Cutthroat</b>						
<b>Tributary</b>	<b>Site estimates</b>		<b>Sample site Area (M<sup>2</sup>)</b>	<b>All Cutthroat per (M<sup>2</sup>)</b>	<b>Available Habitat Area (M<sup>2</sup>)</b>	<b>Cutthroat Population Estimate</b>
	<b>All CUTT</b>	<b>YOY</b>				
<b>First Creek</b>	10 (8.0-20.7)	3 (3.0-6.1)	82.3	0.12	6,208	754
<b>Twenty Five Mile Creek</b>	0 (---)	0 (---)	147.5	0	12,288	0
<b>Mitchell Creek</b>	1 (---)	0 (---)	51.4	0.02	1,686	33
<b>Grade Creek</b>	0 (---)	0 (---)	73.9	0	1,168	0
<b>Safety Harbor Creek</b>	14 (13.0-14.7)	0 (---)	259.9	0.05	1,356	73

Table 9. Estimated 2011 Lake Chelan Tributary Total of All Rainbow & Cutthroat Trout Species Composition, Density and Population Abundance.

<b>Total of All Rainbow &amp; Cutthroat Trout</b>
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<i>Tributary</i>	<i>Estimate</i>
First Creek	1,961
Twenty Five Mile Creek	2,583
Mitchell Creek	459
Grade Creek	237
Safety Harbor Creek	235

**2.2.3. Stehekin River Tributary/Side-Channel Cutthroat and Rainbow Trout Spawner Surveys, NPS**

Rainbow trout and cutthroat trout spawner surveys, in selected Stehekin River side-channels and tributary index reaches were initiated by NPS staff in 2009 in order to evaluate progress towards restoration of adfluvial westslope cutthroat trout. The objective was to annually monitor trends in abundance of cutthroat and rainbow trout spawners (April 15- June 30) at 12 tributary and side-channel index reaches in the lower 8 miles of the Stehekin River.

During 2009, initial habitat surveys (Anthony and Glesne 2010) of all side-channels and tributaries of the lower 8 miles of the Stehekin River were conducted for the purpose of selecting cutthroat and rainbow trout spawner 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.

During 2009 and 2010, four rainbow and cutthroat trout spawning surveys were conducted between mid-April and late June (Anthony and Glesne 2010, Anthony 2011, in prep.). During 2009, fish were observed at 5 of the 12 index reaches. Cutthroat trout were not observed during any of the surveys. A total of 11 adult rainbow trout and one unidentified fish were observed during the four surveys. Thirteen redds were observed in the 4 index reaches and two of these had rainbow trout spawners holding over them. During 2010, a total of 9 fish were observed at 6 of the 12 index reaches and as in 2009 they were all rainbow trout. Nine unknown redds were also observed at one of the index reaches in 2010.

Index stream spawner surveys were again repeated during 2011. Three surveys were conducted between April 26<sup>th</sup> and June 29<sup>th</sup>. As in 2009 and 2010, there were no cutthroat spawners observed in any of the index reach surveys. Seven rainbow trout spawners, four rainbow trout redds, and 14 unknown redds were observed in the index reaches.

Due to the absence of cutthroat spawners in any of the 2009-2011 surveys it is recommended that they be discontinued in 2012. Experimental stocking of cutthroat fry is currently recommended for a limited number of index reaches. Spawner surveys should be reinstated in 2016 to evaluate any improvements resulting from supplemental stocking and/or natural recruitment. In the interim period efforts to evaluate adfluvial cutthroat trout 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 is nearly completed (Anthony and Glesne 2012; currently in peer review).

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

Despite the apparent lack of spawning cutthroat trout in Stehekin River tributary and side-channel index sites (Section 2.2.3.), a number of large (380-460 mm) cutthroat trout were viewed in the mainstem Stehekin River during the late fall and autumn 2010 kokanee surveys. Though not observed while spawning, these observations confirm the presence of large, potentially adfluvial cutthroat in the Stehekin River system. In light of these observations it was decided to increase our survey efforts in 2011 to include snorkeling mainstem pools. Eight large channel spanning pools were identified in the lower 7 km of the mainstem Stehekin River. Snorkel surveys of these eight pools were completed once in the early spring, and six of the eight pools were surveyed twice in the late summer during periods of low river discharge and good underwater visibility. The two pools that were not surveyed in the latter surveys were determined to be poor candidate sites for long term monitoring due to flow and habitat conditions.

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. Adfluvial size cutthroat trout ( $\geq 300$  mm) were observed in four of the eight pools surveyed on five occasions between April 27<sup>th</sup> and August 30<sup>th</sup>. Adfluvial size rainbow trout were observed in all eight pools surveyed on 14 occasions during the same time period. Both rainbow and cutthroat trout were most abundant during the April 27<sup>th</sup> sampling date, coinciding with spring spawning.

Four of the eight pools surveyed in 2011 were selected for continuing surveys in 2012. Pool selection was based on documented cutthroat trout presence and safety of conducting snorkel surveys within the pool. A report including methods, results, and pool location maps will be completed by April 2012.

#### **2.2.5 Stehekin River Tributary and Side-Channel Summer Cutthroat and Rainbow Trout Surveys, NPS**

The 2009-2011 spawner surveys failed to confirm the presence of cutthroat in any of the spawner survey index reaches. As a result, exploratory fish surveys focused on documenting summer and fall abundance of cutthroat and rainbow trout in side-channel

and tributary habitat were implemented in 2011. Surveys were conducted during late July, late August, and early September of 2011. Visual observations and snorkel surveys were used to document species presence and their abundance at 11 of the 12 spawner survey index reaches (Section 2.2.3) during late July and 10 of the index reaches in late August. Cutthroat trout were not observed at any of the index reaches during the late July survey and only two adfluvial size rainbows ( $\geq 300$  mm) and one sub-adult rainbow trout were observed. During the late August survey, a total of eight adfluvial cutthroat trout were observed in five of the index reaches. Juvenile cutthroat trout were not observed during this survey. Juvenile and sub-adult rainbow trout ( $< 300$  mm) were abundant and observed in all of the 10 index reaches surveyed however, adfluvial size rainbow trout were not observed in the late August survey.

The main objective of the September, 10-12 sampling period was to collect young-of-year fish for genetic analysis to provide definitive species information needed to verify successful spawning of cutthroat trout in four of the spawner survey index reaches. Species composition of these samples will also be useful in determining the frequency of rainbow and cutthroat 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 (two in Blackberry Creek and two in Company Creek). Genetic analyses of these 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, 2012. Additional young-of-year samples should be collected from other spawner index reaches in 2012.

In addition to young-of-year sampling, observations and angling were used to document the presence of adfluvial cutthroat and rainbow trout during the September survey. A total of seven cutthroat trout and one rainbow x cutthroat hybrid, all ranging in size from 380-430 mm, were observed during the survey. Tissue samples for genetic analysis were collected from three of these fish caught by angling. Because of these notable observations, increased effort to monitor adfluvial fish in side-channels during the late summer and fall is recommended for 2012.

#### ***2.2.6 Monitor Frequency of Non-Native Rainbow Genetic Introgression in Native 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 rainbow trout and native cutthroat trout. Sites were selected to represent the gradient of introgression ranging from pure cutthroat trout to a mixture of pure fish, F1 and post-F1 hybrids to mostly pure rainbow trout as previously documented in the Ostberg and Rodriguez (2006) publication. Sampling locations corresponded to reach numbers designated in Ostberg and Rodriguez (2006; representing samples collected between 1999 and 2003) publication (below and in Figure 1). Non-lethal tissue samples were collected from 48-50 fish from all of the locations listed below except Location 7, where 24 samples were collected.

- Location 1 (upper Stehekin; SR6)

- Location 2 (Stehekin River above Bridge Creek confluence; SR4)
- Location 3 (Bridge Creek between McAlester and South Fork tribs; BR5)
- Location 4 (Bridge Creek near confluence with Stehekin; BR1)
- Location 5 (North Fork of Bridge Creek; NF)
- Location 6 (Stehekin River below Bridge Creek confluence; SR1 and SR2)
- Location 7 (lower Stehekin River below confluence of Agnes Creek; previously unsampled)

Laboratory analyses have been completed (USGS-WFRC, Seattle) and a draft journal submission is currently in peer review. Tentative results provided by Carl Ostberg indicate that there has not been any significant change in the frequency of westslope cutthroat, rainbow trout, and hybrids between the two time periods at any of the locations sampled. The 24 samples taken from the new location in the lower Stehekin below Agnes Creek confluence resulted in mostly rainbow trout as expected (22 rainbow and 2 hybrids).

**(b) Genetic Introgression in Cutthroat Trout**

(Ostberg and Rodriguez 2006)

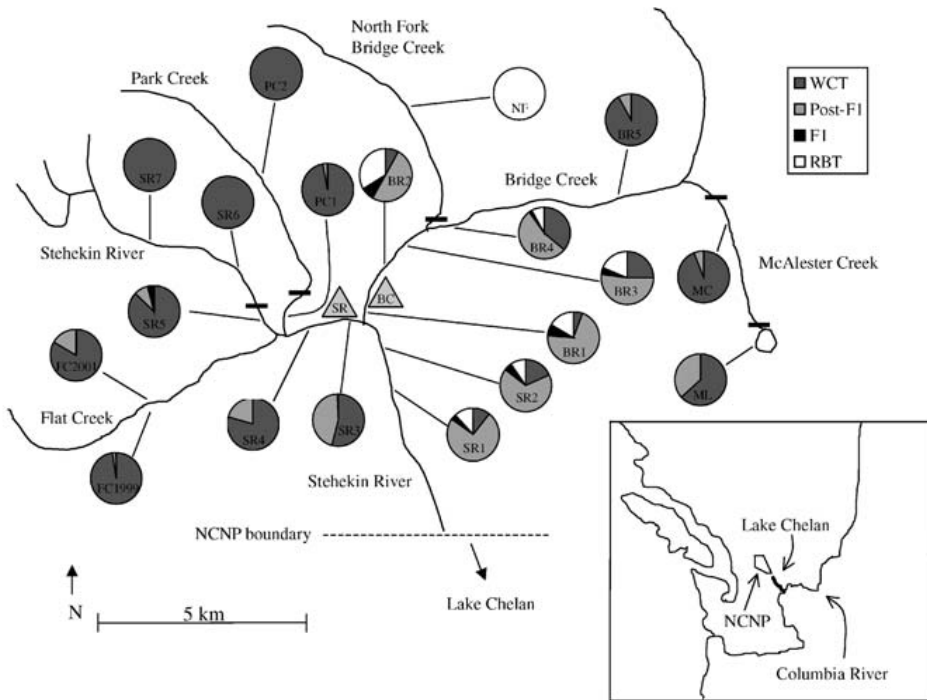


Figure 1. Genetic introgression in cutthroat trout collected between 1999 and 2003 in the Stehekin River Basin.

It is recommended that we continue to monitor cutthroat introgression every five to ten years to evaluate cutthroat trout status and progress towards cutthroat trout 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 maintain this, 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. 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.

#### ***2.3.2 Mainstem Stehekin River and Tributary/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 side-channels/tributaries in the lower 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 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/tributary 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/tributary habitat was determined using the Area Under the Curve Method (AUC: Beidler and Nickelson 1980). Tentative results show a total of 50,580 kokanee using the mainstem Stehekin channel and 131,568 kokanee using the side-channel/tributary habitat. Total kokanee spawner escapement was estimated at 182,148 fish. A detailed report will be nearly completed by NPS-NOCA staff and should be available by May 2012.

Replication of this survey is recommended at three to five year intervals. Results can 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.

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#### **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, 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.

### **SECTION 3: MEASURES TO BE IMPLEMENTED IN 2012**

The following addresses Tributary Barriers, Fish Stocking, and the Monitoring and Evaluation Program measures that will be implemented in 2012.

#### **3.1 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 LCFE 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 LCFE at the June 17, 2008 meeting were Safety Harbor, Mitchell, Grade, and Gold creeks.

**However, even with the selection of priority tributaries, the LCFE 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 effect 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](http://www.chelanpud.org/lc-Resource-Documents-LCFF)):

**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 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.
3. ▲ -----

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

**Moved down [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.

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.

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**3.2 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)).

In 2009, WDFW released approximately 50,000 WSCT (at a size of 15 fish/pound) at Lakeside and Mill Bay in March, and approximately 70,000 triploid RBT (at a size of 3 fish/pound) at Lakeside in August and September (Art Viola, WDFW, pers. com.). Approximately 227,000 kokanee fingerlings, taken from broodstock collected in fall 2006 from the Stehekin River, were released into Lake Chelan near the Yacht Club in May (at a size of 75 fish/lb.). Additionally, approximately 175,000 WSCT fry were released into Twenty-five Mile, Mitchell, Prince, Safety Harbor, Fish, Grade, and First creeks (at a size of 600 fish/lb.) in June and July.

The stocking plan from WDFW for 2010 is shown in Table 5 (Art Viola, WDFW, pers. com.).

**Table 5. 2010 Fish Stocking Plan**

Location	Species	Stock	Number	No. Fish/lb	Stocking date
Lake Chelan Tributaries					

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Lake Chelan Fishery Forum 2012 Annual Work Plan

Four Mile Creek	Cutthroat	Twin LK	10,000	Eyed eggs	June	Formatted: Font: 10 pt
Cascade Creek	Cutthroat	Twin LK	5,000	Fry	June or July	Formatted: Font: 10 pt
Bear Creek	Cutthroat	Twin LK	3,000	Fry	June or July	Formatted: Font: 10 pt
Big Creek	Cutthroat	Twin LK	2,000	Fry	June or July	Formatted: Font: 10 pt
<b>Lake Chelan</b>	Cutthroat	Twin LK	50,000	15	March	Formatted: Font: 10 pt
		ad clipped	(80%)			Formatted: Font: 10 pt
	Kokanee	Lake Chelan	80,000	80	Mid May	Formatted: Font: 10 pt
	Triploid Rainbows	Spokane	50,000	3	August-September	Formatted: Font: 10 pt
<b>Mill Creek</b>	Cutthroat	Twin LK	3,000	Fry	June or July	Formatted: Font: 10 pt
	Triploid Chinook <sup>1</sup>	summer	50,000	Fry	March	Formatted: Font: 10 pt

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

The actual number of fish released by WDFW into Lake Chelan in 2010 is presented in Table 6 (Corey Morrison, WDFW, pers. com.).

**Table 6. 2010 Actual Fish Stocking**

Location	Species	Stock	Number	No. Fish/lb	Stocking date	
<b>Lake Chelan Tributaries</b>						Formatted: Font: 10 pt
Four Mile Creek	Cutthroat	Twin LK				Formatted: Font: 10 pt
Cascade Creek	Cutthroat	Twin LK	5,000	Fry	June or July	Formatted: Font: 10 pt
Bear Creek	Cutthroat	Twin LK	3,000	Fry	June or July	Formatted: Font: 10 pt
Big Creek	Cutthroat	Twin LK	2,000	Fry	June or July	Formatted: Font: 10 pt
<b>Lake Chelan</b>	Cutthroat	Twin LK	52,180	5.6	June-July	Formatted: Font: 10 pt
		ad clipped	(80%)			Formatted: Font: 10 pt
	Kokanee	Lake Chelan	89,119	64	May 5 <sup>th</sup> - 6 <sup>th</sup>	Formatted: Font: 10 pt
	Triploid Rainbows	Spokane	555	0.36	May - September	Formatted: Font: 10 pt
	Triploid Rainbows	Spokane	19,545	3	August-September	Formatted: Font: 10 pt
<b>Mill Creek</b>	Cutthroat	Twin LK	3,000	Fry	June or July	Formatted: Font: 10 pt
	Triploid Chinook <sup>1</sup>	summer	42,000	100	March	Formatted: Font: 10 pt

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

The stocking plan from WDFW for 2011 is shown in Table 7 below (Corey Morrison, WDFW, pers. com.).

**Table 7. 2011 Fish Stocking Plan**

Location	Species	Stock	Number	No. Fish/lb	Stocking date
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Lake Chelan Fishery Forum 2012 Annual Work Plan

Lake Chelan Tributaries					
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
Lake Chelan					
	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
Mill Creek					
	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

The actual number of fish released by WDFW into Lake Chelan in 2011 is presented in Table 8 (Corey Morrison, WDFW, pers. com.).

Table 8. 2011 Actual Fish Stocking

Location	Species	Stock	Number	No. Fish/lb	Stocking date
Lake Chelan Tributaries					
First Creek	Cutthroat	Twin LK	26,899	Fry	Early September
Lake Chelan					
	Cutthroat	Twin LK	137,224	Fry	Late September
	Cutthroat	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 program is not funded by Chelan PUD

The stocking plan from WDFW for 2012 is shown in Table 9 below (Corey Morrison, WDFW, pers. com.).

Table 9. 2012 Fish Stocking Plan

Location	Species	Stock	Number	No. Fish/lb	Stocking Date
Twenty Five Mile Creek	Cutthroat	Twin LK	29,091	Fry	June or July

Lake Chelan Fishery Forum 2012 Annual Work Plan

First Creek	Cutthroat	Twin LK	14,545	Fry	June or July	Formatted: Font: 10 pt
Grade Creek	Cutthroat	Twin LK	3,636	Fry	June or July	Formatted: Font: 10 pt
Safety Harbor Creek	Cutthroat	Twin LK	2,727	Fry	June or July	Formatted: Font: 10 pt
Company Creek	Cutthroat	Twin LK	78,750	Fry	June or July	Formatted: Font: 10 pt
Blackberry Creek	Cutthroat	Twin LK	81,900	Fry	June or July	Formatted: Font: 10 pt
Lake Chelan	Cutthroat	Twin LK	50,000	15	March	Formatted: Font: 10 pt
		ad clipped (80%)				Formatted: Font: 10 pt
	Kokanee	Lake Chelan	80,000	80	Mid May	Formatted: Font: 10 pt
	Triploid Rainbow	Spokane	1,000	0.5	May - September	Formatted: Font: 10 pt
	Triploid Rainbow	Spokane	50,000	2.5	August - September	Formatted: Font: 10 pt
Mill Creek	Cutthroat	Twin LK	3,000	Fry	June or July	Formatted: Font: 10 pt
	Triploid Chinook <sup>1</sup>	summer	50,000	100	March	Formatted: Font: 10 pt

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

**3.3 Monitoring and Evaluation Program**

**3.3.1 Comprehensive Creel Surveys, WDFW**

Comprehensive creel surveys will be conducted beginning in 2010. Surveys are designed to: 1) monitor the contribution (*naturally produced or hatchery released*) of Westslope cutthroat, 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. The next Comprehensive Creel Survey will be completed in 2013.

**Estimated Budget and Schedule: No funds requested for 2012**

**3.3.2 2012 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).

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**Estimated USFS Budget and Schedule:**

Year	Task	Total \$	Requested \$ (LC06b1)	Requested PUD Matching \$ (LC06b2)	USFS Matching \$
2012 April	Install temperature data loggers (GS11 fisheries biologist)	\$360		\$180	\$180

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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>2012 Estimated Totals</b>	<b>\$8,790</b>	<b>\$1,000</b>	<b>\$3,895</b>	<b>\$3,895</b>

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

Beginning in 2011 and continuing into 2012, and every third and fourth year thereafter, WDFW will sample First, 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. If time and manpower allow all or some of the following additional seven creeks may also be sampled in 2012: Gold, Prince, Railroad, Fish, Pyramid and Four Mile. If not, these creeks will be surveyed in 2013. This sequence of sampling effort will begin again in 2013 and continue into 2014. (see Section 2.2.2).

**Estimated WDFW Budget and Schedule:**

Year	Task	Total \$	Requested \$ (LC06b1)	Requested PUD Matching \$ (LC06b2)	WDFW Matching \$
2012	Salaries	\$13,087.18		\$6,543.59	\$6,543.59
2012	Benefits	\$1,327.84		\$663.92	\$663.92
2012	Goods and Services	\$381.10	\$381.10		
2012	Travel	\$1,081.50	\$1,081.50		
2012	Total Direct Costs	\$15,877.62	\$1,462.60	\$7,207.51	\$7,207.51
2012	WDFW overhead @23.51%	\$3,732.84	\$343.86	\$1,694.49	\$1,694.49
	<b>2012 Estimated Totals</b>	<b>\$19,610.46</b>	<b>1,806.46</b>	<b>\$8,902.00</b>	<b>\$8,902.00</b>

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**3.3.4 Stehekin River Tributary/Side-Channel Cutthroat and Rainbow Trout Spawner Surveys, NPS**

Due to the absence of cutthroat spawners in any of the 2009-2011 surveys it is recommended that they be discontinued in 2012 (see Section 2.2.3). Experimental stocking of cutthroat fry is currently recommended for sections of the Company and Blackberry Creek side-channels containing suitable rearing habitat and that also include four of the spawning survey index reaches.



A total of 78,750 cutthroat fry will be stocked in the Company Creek side-channel (2.5 km, 17,500 m<sup>2</sup> surface area) and 81,900 cutthroat fry in the Blackberry Creek side-channel (1.4 km, 18,200 m<sup>2</sup> surface area). Both channels have an average depth of approximately 0.5 m. Spawner surveys should be reinstated in 2016 to evaluate any improvements resulting from supplemental stocking and/or natural recruitment.

**Estimated Budget and Schedule: No funds requested for 2012**

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**3.3.5 Stehekin River Mainstem Cutthroat and Rainbow Trout Surveys, NPS**

Despite the apparent lack of spawning cutthroat trout in Stehekin River tributary and side-channel index sites (Section 2.2.3), a number of large, 380-460 mm, cutthroat trout were viewed in the mainstem Stehekin River during the late fall and autumn 2010 confirming the presence of large, potentially adfluvial cutthroat in the Stehekin River system.

Lower mainstem Stehekin River exploratory spring and fall snorkel surveys of pool/tail-out habitat were conducted in 2011. The objectives of these surveys were to gain a better understanding of adfluvial cutthroat trout 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 rainbow trout. Results provided additional confirmation of large adfluvial cutthroat trout use in the mainstem Stehekin River and recommendations were made to continue snorkel surveys at four of the index pools during successive years (see Section 2.2.4). In addition, it is recommended that exploratory snorkel surveys of depositional zone riffle habitat be conducted in the lower 10 km of the mainstem in order to expand data collection efforts to all potential habitat utilized by adfluvial cutthroat trout in the mainstem.

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

**Estimated Budget and Schedule:**

Year	Task	Total \$	NPS Requested \$ (LC06b1)	Requested PUD Matching \$ (LC06b2)	NPS Matching \$
2012 Apr-Sept	Conduct one spring snorkel survey and two Aug/Sept surveys in 4 lower mainstem pools (1-GS/9)	\$2963	\$1035	\$964	\$964

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	Ecologist and 1-GS/6 Bio Tech for total of 12 person-days)				
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 16 person-days)	\$3950		\$1975	\$1975
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)	\$5068		\$2534	\$2534
	<b>2012 Estimated Totals:</b>	\$13,481	\$2535	\$5473	\$5473

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**3.3.6 Stehekin River Tributary/Side-Channel Summer Cutthroat and Rainbow Trout Surveys, NPS**

Exploratory surveys designed to supplement information from the tributary and side-channel cutthroat and rainbow trout spawner surveys were conducted at spawner index reaches in July and August of 2011. Another survey was conducted in September, but was limited to only four spawner index reaches located in the Blackberry and Company Creek side-channels. Young-of-year cutthroat and rainbow were collected at these four index reaches for genetic analysis to provide definitive species information needed to verify successful spawning of cutthroat trout. In addition, observations and angling at these four sites revealed the presence of a significant number of large adfluvial cutthroat trout which likely moved into these side-channels to feed on kokanee eggs (see Section 2.2.5).

Plans for 2012 include conducting snorkel and visual observation surveys during August and September to determine abundance and distribution of adfluvial cutthroat and rainbow trout at all of the tributary/side-channel spawner index reaches. Juvenile cutthroat and rainbow trout abundance and other species abundance information will also be collected during these surveys. Collection of young-of-year samples for genetic species verification will be completed at three more spawner index reaches. 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 \$
2012 Aug-Sept	Conduct two snorkel surveys (Aug/Sept) in 11 side-channel/trib. index reaches (1-	\$3950	\$1380	\$1285	\$1285

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	GS/9 Ecologist and 1-GS/6 Bio Tech for total of 16 person-days)				
▲ Aug-Sept	Collect cutthroat/rainbow young-of-year for genetic analysis in three previously unsampled spawner index reaches (1-GS/9 Ecologist and 1-GS/6 Bio Tech for total of 8 person-days)	\$1976	\$690	\$643	\$643
▲ Oct-Dec	USGS –BRD Lab analyses, Data Mgt. and Reporting (75 samples @ \$40/sample including Overhead)	\$3000	\$1000	\$1000	\$1000
▲ Aug-Sept	Travel (Ferry and per diem)	\$520	\$520		
▲ Aug-Sept	Vehicle (0.25 months @ \$800/month)	\$200			\$200
▲ Aug-Sept	Supplies	\$300			\$300
▲ Nov-Dec	Data Mgt. and Reporting (1- GS9 Ecol. for 12 days, GS12 Ecol. – 3 days)	\$5068		\$2534	\$2534
	<b>2012 Estimated Totals:</b>	\$15014	\$3590	\$5462	\$5962

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

Chelan PUD will conduct annual fall spawning surveys for kokanee and land-locked Chinook salmon in 2012, 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). Results of 2011 kokanee spawning surveys are contained in the Lake Chelan Kokanee Spawning Ground Surveys, 2011 Final Report at the following link:

[Link to be added.](#)

**Estimated Budget and Schedule:**

The cost of conducting kokanee spawning surveys in 2012 is estimated to be \$12,000. Weekly surveys will be conducted beginning in early September and continuing through mid-October or until the kokanee run ends. 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 in previous years. Additional surveys may be conducted in these creeks in 2012 due to increased abundance of spawning kokanee observed in 2011.

**3.3.8 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 fish species and origin (naturally produced or hatchery released) contributing to the sport fishery; and 2) determine what species of fish anglers prefer to catch.

Year	Task	Total \$	Requested \$ (LC06b1)	Requested \$ LC06b2	WDFW Matching \$
2012	Salaries	\$4,808.04		\$2,404.02	\$2,404.02
2012	Benefits	\$1,103.28		\$551.64	\$551.64
2012	Goods & Services	\$901.25	\$901.25		
2012	Travel	\$568.05	\$568.05		
2012	WDFW overhead @23.51%	\$1,735.19	\$345.43	\$694.88	\$694.88
	<b>2012 Estimated Totals</b>	<b>\$9,115.81</b>	<b>\$1,814.73</b>	<b>\$3,650.72</b>	<b>\$3,650.72</b>

**3.3.9 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.

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**Summary of 2012 LCFP Expenditures**

Measure	Estimated M&E Cost	Amount to be provided by Chelan PUD	Agency Cost-share	Task
Comprehensive Creel Surveys (WDFW)	\$0	\$0	\$0	Section 3.3.1
Lake Chelan Tributary Trout Spawning Surveys (USFS)	\$8,790	\$4,895	\$3,895	Section 3.3.2
Lake Chelan Tributary Estimates of Juvenile Cutthroat and Rainbow Trout Abundance (WDFW)	\$19,610.46	\$10,708.46	\$8,902	Section 3.3.3
Stehekin River Tributary/Side-Channel Cutthroat and Rainbow Trout Spawner Surveys (NPS)	\$0	\$0	\$0	Section 3.3.4
Stehekin River Mainstem Cutthroat and Rainbow Trout Surveys (NPS)	\$13,481	\$8,008	\$5,473	Section 3.3.5
Stehekin River Tributary/Side-Channel Juvenile Summer Cutthroat and Rainbow Trout Surveys (NPS)	\$15,014	\$9,052	\$5,962	Section 3.3.6
Fall Index Stream Kokanee Spawning Surveys (PUD)	\$12,000	\$12,000		Section 3.3.7
Kokanee Creel Survey (WDFW)	\$9,115.81	\$5,465.45	\$3,650.72	Section 3.3.8
<u>Kokanee Stocking Monitoring and Evaluation – Fin Clipping (WDFW)</u>	<u>\$6,200</u>	<u>\$6,200</u>		<u>Section 3.3.9</u>
<b>Total M&amp;E Survey Costs</b>	<b>\$84,211</b>	<b>\$56,239</b>	<b>\$27,883</b>	
Tributary Barriers			N/A	Section 3.1
Fish Stocking	\$30,000	\$30,000	N/A	Section 3.2
<b>TOTAL</b>	<b>\$114,211.27</b>	<b>\$86,328.91</b>	<b>\$27,883.72</b>	

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## Sokolowski, Rosana

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**From:** Osborn, Jeff  
**Sent:** Saturday, February 18, 2012 4:55 PM  
**To:** Alex Martinez; Bitterman, Deborah; Bob Goedde; Bruce Heiner; Carl Merkle; Catherine Willard; Graham Simon; Hays, Steve; Hugh Anthony; Jeff Korth; Jerry Marco; Miller, Joseph; Osborn, Jeff; Pat Irle; Phil Archibald; Reed Glesne; Smith, Michelle; Steve Lewis; Travis Maitland; Truscott, Keith  
**Cc:** Loidhamer, Amber; Sokolowski, Rosana  
**Subject:** Final Lake Chelan Fishery Forum 2012 Annual Work Plan

Dear Lake Chelan Fishery Forum: Please find the links below that will take you to the Lake Chelan Fishery Resource Documents page where you will see the Final Lake Chelan Fishery Forum 2012 Annual Work Plan posted:

<http://www.chelanpud.org/lc-Resource-Documents-LCFF.cfm>

And a link to the final plan:

[http://www.chelanpud.org/departments/licensingCompliance/lc\\_implementation/ResourceDocuments/38177.pdf](http://www.chelanpud.org/departments/licensingCompliance/lc_implementation/ResourceDocuments/38177.pdf)

Thank you, everyone, for your help with drafting this plan. I will be working with PUD staff to get everything planned into the schedule and budget.

**Jeff Osborn**  
**License Program Coordinator**  
**Natural Resources Programs**  
**Public Utility District No. 1 of Chelan County**  
**327 North Wenatchee Avenue**  
**PO Box 1231**  
**Wenatchee, WA 98807-1231**  
**Phone: 509-661-4176**  
**FAX: 509-661-8203**  
**Email: [jeff.osborn@chelanpud.org](mailto:jeff.osborn@chelanpud.org)**