

Lake Chelan Cutthroat Trout Spawning Ground Surveys

2009

Draft Report



Cutthroat trout in Safety Harbor Creek-USFS 2009

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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 is submitted in partial fulfillment of Article 404 requirements for annual reporting of fishery monitoring activities associated with item #4 of 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.

The Article 404 – Lake Chelan Fishery Forum 2009 Annual Work Plan dated February 11, 2009, 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 sport fishery.

Tributary stream spring spawning surveys are among the monitoring and evaluation measures agreed to by the LCFF. 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 (Lake Chelan Fishery Plan 2007). Spring spawning surveys are needed to determine the success of these fish enhancement efforts and to signal the possible need of adaptive changes. To catalogue the results of the spring spawning surveys a database must be constructed. Data will be analyzed and evaluated to determine if efforts are meeting the goal and objectives 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.

Beginning in 2009, tributary Cutthroat Trout (*Oncorhynchus clarki* sp.) and Rainbow Trout (*Oncorhynchus mykiss*) abundance surveys (48 days) will be conducted once every 3 years in some of the following tributaries: 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.

Study Area and Methods

Lake Chelan lies on the east slope of the Cascade Mountains in northern Chelan County in central Washington. The lake is approximately 1 mile wide and 50 miles long, extending from the Columbia River breaks to the high Cascades. The lake's maximum elevation is 1,100 feet above mean sea level (m.s.l.). During the study period, lake elevation ranged from 1086 feet m.s.l. on 4/15/2009 to 1099 feet m.s.l. on 6/25/2009. The four study streams in 2009 were, in order from downlake to uplake, Mitchell Creek, Gold Creek, Grade Creek, and Safety Harbor Creek. All of the survey area lies within the Wenatchee National Forest, Chelan Ranger District except for privately owned land at the mouth of Gold Creek.

During the 2009 spawning season (April-June) USDA Forest Service fish biologists performed spawning ground surveys in the adfluvial zones of Mitchell, Gold, Grade, and Safety Harbor Creeks according to the methodology of the Lake Chelan Comprehensive Management Plan (Viola and Foster 2002). Survey frequency was one survey per stream per week. Surveys were accomplished by wading the adfluvial stream segments from their lake confluence to the first passage barrier above the 1100 foot elevation (see Figure 5 in Appendix A). Surveyors observed stream substrate for the presence of spawning gravel (0.5 to 5 cm in diameter) and any disturbance of that gravel to indicate redd construction. Forest Service fish biologists Archibald and Johnson have more than 10 years each experience conducting spawning (redd) surveys for steelhead and bull trout. Incidental observations of individual fish were tallied with an estimated length. In Mitchell, Gold, and Safety Harbor Creeks two fish (each stream) were captured by hook-and-line for sample-in-hand identification, photographed (see Appendix A), and released in good condition.

At the conclusion of the spawning season, three of the four streams were snorkeled to determine fish presence by species and size, estimate relative fish densities, and search for young-of-the-year as evidence of spawning within the adfluvial reaches. The entire adfluvial segments of Gold and Grade Creeks were snorkeled, 50 meters of Safety Harbor Creek containing two large pools were snorkeled, and Mitchell Creek was not snorkeled due to shallow water, poor visibility due to fine sediment and very brushy channel conditions.

As part of this effort, surveyors searched for evidence of “shoal spawning” in the shallower waters near tributary mouths. Shoal spawning observations were made on several occasions from a slow-moving boat where the lake bottom was visible from the surface using polarized sunglasses.

Sexual maturation, the onset of spawning, and embryo development are significantly regulated by the “thermal experience” of the fish populations of interest. Accordingly, water temperature data loggers were deployed in survey streams starting with the first (pre-spawning) survey and remained in place until late-September. Data loggers were programmed to record water temperature every 30 minutes.

Results and Discussion

Mitchell Creek

No evidence of cutthroat or rainbow trout spawning was observed in Mitchell Creek in 2009. Stream flow was consistently low and clear throughout the survey period. The surveyed reach began at the confluence of Mitchell Creek with Lake Chelan and continued upstream for approximately 450 meters. Within this reach, spawning gravels were very limited with stream substrate consisting of large cobbles and small boulders covered by a layer of mud and silt. Visibility was generally good as long as surveyors walked along the bank and did not stir up the mud and silt by wading through the stream. Small trout (7-10 cm in length) were observed during most weeks that Mitchell Creek was surveyed. On April 22, a 10 cm rainbow trout was caught via hook and line near the end of the surveyed reach. Gill tissue was visible due to eroded/deformed opercula which could indicate hatchery origins (see Figure 3 in Appendix A).

Gold Creek

No evidence of cutthroat or rainbow trout spawning was observed in Gold Creek in 2009. Surveys began at the confluence of Gold Creek and Lake Chelan and continued upstream for approximately 250 meters to a barrier boulder cascade. Substrate within this reach consisted primarily of boulders and cobbles with pockets of potential spawning gravels along the stream margins and pool tail-outs. Visibility within Gold Creek varied due to fluctuating stream flow as the survey period encompassed peak runoff. Small trout (8-12 cm in length) were observed during most weeks that Gold Creek was surveyed. On April 22, a 12 cm rainbow trout was caught via hook and line near the end of the surveyed reach (see Figure 1 in appendix A). Gold Creek was snorkeled on June 25, 2009, with 21 rainbow trout and three hatchery cutthroat trout (opercula were misshapen) observed (see Table 2).

Grade Creek

No evidence of cutthroat or rainbow trout spawning was observed in Grade Creek in 2009. Surveys began at the confluence of Grade Creek and Lake Chelan and continued upstream for 220 meters to a 5.6 meter barrier falls (see Figure 5 in Appendix A). Substrate within this reach consisted primarily of boulders and cobbles with pockets of potential spawning gravels along the stream margins and pool tail-outs. Visibility within Grade Creek varied due to fluctuating stream flow as the survey period encompassed peak runoff. Two small trout (8 and 12 cm in length) were observed during two different surveys of Grade Creek. Surveyors attempted a hook and line survey with no success. Grade Creek was snorkel surveyed on July 30, 2009 with 88 rainbow trout observed (see Table 2).

Safety Harbor Creek

No evidence of cutthroat or rainbow trout spawning was observed in Safety Harbor Creek in 2009. Surveys began at the confluence of Safety Harbor Creek and Lake Chelan and continued upstream for approximately 450 meters to a barrier boulder cascade. Substrate within this reach consisted primarily of boulders and cobbles with pockets of potential spawning gravels along the stream margins and pool tail-outs. Visibility within Safety Harbor Creek varied due to fluctuating stream flow as the survey period encompassed peak runoff. No trout were observed during all weeks that Safety Harbor Creek was surveyed. Hook and line surveys were attempted on two occasions early in the spawning season with no success, however during a third survey later in the season two rainbow trout (15 cm, Figure 4) and one cutthroat trout (25 cm) were caught and released in lower Safety Harbor Creek. A short snorkel survey, 50 m of Safety Harbor Creek, was conducted on July 30, 2009 (see Table 2). Sixty-three rainbow trout and four cutthroat trout were observed in Safety Harbor Creek, including young of the year (<2.5 cm).

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 Gold, Grade and Safety Harbor Creeks, 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	ONMY	0	11	9	1
				ONCL	0	0	3	0
Grade Creek	7/30/2009	1099.9	220	ONMY	4	35	39	10
Safety Harbor Creek	7/30/2009		50	ONMY	5	35	19	4
				ONCL	0	0	3	1

Summary and Conclusions

As part of the monitoring and evaluation measures agreed to by the LCFF, spring spawning surveys for cutthroat and rainbow trout were conducted on the following tributaries to Lake Chelan in 2009; Mitchell Creek, Gold Creek, Grade Creek and Safety Harbor Creek. The spawning survey period extended from April 15th to June 3rd in order to encompass the appropriate stream temperatures (5° to 9°C, see Figure 1) and stream flow (ascending hydrograph) needed for cutthroat and rainbow trout to initiate spawning (Duke Engineering & Services 2001). Spawning surveys were limited to the lower (220 to 450 meters) adfluvial zones of tributary streams. Within these reaches the dominant substrate in all tributaries consisted of cobbles and boulders with suitable spawning gravels limited to pool tail-outs and stream margins. Visibility within these creeks was good during the initial surveys when stream flow was low and clear. As stream flow increased and waters became turbid (5/6 to 5/20) due to snow melt and precipitation, visibility decreased. Suitable sized gravels did not show any evidence of being excavated by spawning cutthroat or rainbow trout (gravels were not sorted and there was no identifiable depression or mound in the direction of the predominant water flow).

Snorkel surveys were conducted later in the summer on Gold, Grade and Safety Harbor Creeks (see Table 2) in order to identify fish by species and length as well as identifying any emergent fry (young of the year), which would indicate that spring spawning had occurred. Except for three hatchery cutthroat trout in Gold Creek, both Gold and Grade Creeks had populations consisting of rainbow trout (see Table 2). Rainbow trout in both streams were less than 30 cm in length which would indicate that they are resident and not adfluvial trout (Duke Engineering & Services 2001). Both cutthroat trout and rainbow trout were observed during the snorkel survey of Safety Harbor Creek, including some fish that appeared to be hybrids of the two species. All fish observed in Safety Harbor Creek were less than 30 cm and were therefore considered resident (not adfluvial) fish. No emergent fry (<25 mm) were observed in Gold Creek, however four emergent fry were observed in Grade Creek and five in Safety Harbor Creek. The presence

of emergent fry in Grade and Safety Harbor Creek would indicate that spawning had occurred in the spring. Based on previous studies of salmon and trout, cutthroat fry are estimated to emerge from redds 61- 25 days after they are spawned depending on water temperatures that range from 5° to 11°C (Quinn 2005). Therefore, emergent fry that were observed in Grade Creek and Safety Harbor Creek on July 30th were most likely spawned between mid-May and late June. This coincides with the dates of spawning surveys in 2009, however high flows and low visibility due to turbid waters hindered identification of redds.

No adfluvial cutthroat or rainbow trout (>30 cm in length) were identified in any of the surveyed tributaries in 2009. Gradient and high flow barriers at the mouths of Gold and Grade Creek were present during the spawning survey time period and were not inundated until after June 3rd when the lake level reached approximately 1092 ft. msl. The draw down zone of Safety Harbor Creek did not appear to present a barrier to upstream fish migration in 2009, therefore adfluvial cutthroat could have potentially migrated upstream during the spawning period. Stream flow in Mitchell Creek was low throughout the survey period and was potentially a barrier to upstream migration.

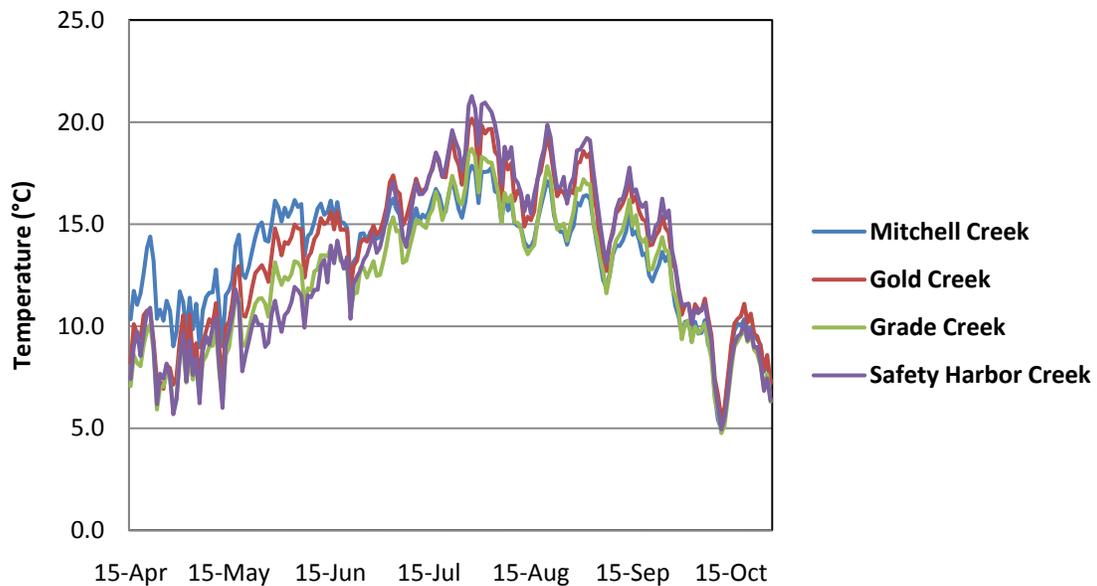


Figure 1. Daily Maximum Stream Temperature Data for North Shore Lake Chelan Tributaries

References

Duke Engineering & Services, Inc. 2001. Fisheries Investigation Addendum Study Report. *prepared for*, Public Utility District No. 1 of Chelan County. Wenatchee, WA.

Powers, P. and R. Tanner. 2008. USDA FS Region 6 Stream Restoration Assistance Team Review of Lake Chelan Tributaries. Unpublished report to Okanogan-Wenatchee National Forest. Wenatchee, WA

Quinn, Thomas P. 2005. The Behavior and Ecology of Pacific Salmon and Trout. University of Washington Press. Seattle, WA.

Viola A. and J. Foster. 2002. Lake Chelan Comprehensive Fishery Management Plan. Region 2. Washington Department of Fish and Wildlife. Wenatchee, WA.

Appendix A

2009 Lake Chelan Cutthroat Spawning Survey Photos



Figure 2. Rainbow trout with eroded opercula in Gold Creek-2009



Figure 3. Rainbow trout with eroded opercula in Mitchell Creek-2009



Figure 4. Cutthroat/Rainbow Hybrid in Safety Harbor Creek-2009

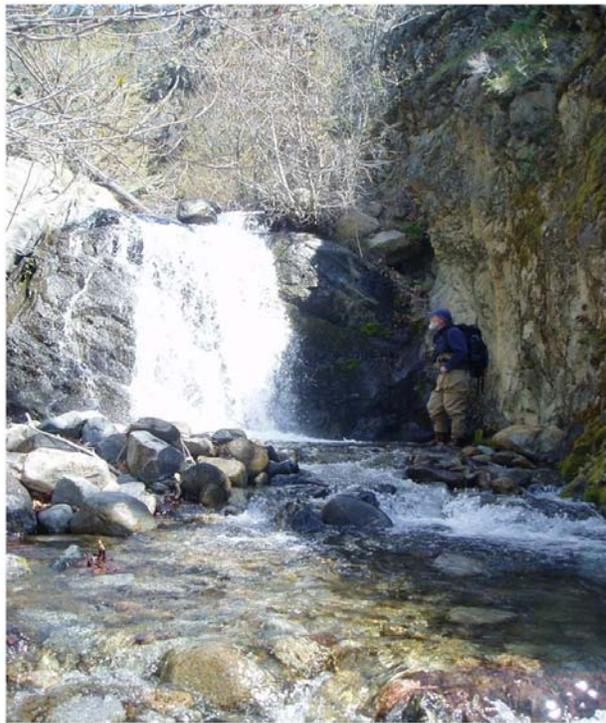


Figure 5. Barrier Falls in Grade Creek