PACIFICORP ENERGY
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Threatened and Endangered Species

Annual Bull Trout (*Salvelinus confluentus)* Monitoring Report

2008

North Fork Lewis River Hydroelectric Projects

Merwin	*FERC No. 935*
Yale	*FERC No. 2071*
Swift No. 1	*FERC No. 2111*
Swift No. 2	*FERC No. 2213*

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1.0 INTRODUCTION

PacifiCorp and the Public Utility District No. 1 of Cowlitz County, Washington (Cowlitz PUD) (collectively the Utilities) are involved in various bull trout (*Salvelinus confluentus*) and salmonid monitoring programs on the North Fork Lewis River in southwest Washington. These monitoring programs and this report are designed to meet requirements pursuant to Article 402 in the Utilities existing Federal Energy Regulatory Commission (FERC) operating licenses for the Merwin, Yale, Swift No. 1 and Swift No. 2 hydroelectric projects and to meet requirements pursuant to sections 9.6 and 14.2.6 of the Lewis River Settlement Agreement (SA). This report and monitoring programs also serve to meet requirements contained in the 2006 Biological Opinion issued to PacifiCorp and Cowlitz PUD by the U.S. Fish and Wildlife Service (FWS). All activities are developed in consultation with the USFWS. This report provides results from
programs that are either ongoing or have been completed in 2008. For methods and general descriptions of all programs please refer to the Annual Bull Trout Monitoring Plan for the North Fork Lewis River 2008 that was submitted to the USFWS, members of Lewis River Aquatic Coordination Committee (ACC) and FERC in March 2008.

2.0 STUDY AREA

Bull trout monitoring activities are performed on the North Fork Lewis River and its tributaries above Merwin dam commencing at river mile (RM) 19.5 and ending at Lower Falls, a complete anadromous fish barrier at RM 72.5. The North Fork Lewis River above Merwin dam is influenced by three reservoirs created from hydroelectric facilities; 4,000 acre Lake Merwin, 3,800 acre Yale Lake, and the largest and furthest upstream 4,600 acre Swift Reservoir. From Lower Falls downstream, the North Fork Lewis is free-flowing for about 12 miles until the head of Swift Reservoir at RM 60. A map of the study area for all programs is shown in Map 2.0-1.

Bull trout are found in all three reservoirs with the bulk of the population residing in Swift Reservoir. Only three known bull trout spawning streams are found in the study area; Rush and Pine Creeks, tributaries to the North Fork Lewis River above Swift Reservoir, and Cougar Creek a tributary to Yale Lake. Current genetic analysis identifies two distinct sub-populations residing within the basin, Rush Creek bull trout and Pine Creek bull trout. Genetically bull trout residing in Yale Lake are a mixture of the two sub-populations found in Swift Reservoir (Nerass and Spruell 2004).

3.0 METHODS AND RESULTS

During 2008, the Utilities participated in, funded or initiated eight monitoring programs. Of those programs, seven are ongoing and will continue in 2009. In addition to those ongoing monitoring programs, completed programs consisted of two single-pass electrofishing surveys and two snorkel surveys on tributaries to Pine Creek and the Lewis River including the Swift Bypass Reach downstream of Swift dam. The purpose of these surveys was: (1) to determine presence (or absence) of bull trout, and (2) to determine species abundance and composition

prior to habitat improvement work slated to begin in summer 2009 (as in the case of the Swift Bypass Reach constructed channel survey).

Bull Trout and Salmonid Monitoring Programs completed or ongoing in 2008 include:

1. Swift reservoir population estimate (ongoing)
2. Yale tailrace collection and transport (ongoing)
3. Swift bypass surveys (ongoing/completed)
4. Pine Creek and Upper Lewis River tributary surveys (completed)
5. Cougar Creek spawning estimate (ongoing)
6. Swift Reservoir rainbow trout stomach content analysis (ongoing)
7. Swift Creek surveys (ongoing/completed)
8. Bull trout condition factor K (ongoing)

3.1 ESTIMATE OF STAGING BULL TROUT THAT MIGRATED UP THE NORTH FORK LEWIS RIVER FROM EAGLE CLIFFS

MARKING:

Tangle net collection activities at the upper end of Swift reservoir began on May 22, 2008 and continued through July 30, 2008 (Appendix A). In total, eleven netting days were completed during the period. A total of 88 bull trout were captured in the Eagle Cliffs area of Swift reservoir. Of these, 63 were tagged with a yellow colored Floy® tag and 11 were tagged with a red/green bi-color Floy® tag. The use of two different Floy® tag color sets was new for 2008. The two color sets were used in an attempt to assess the migration patterns of differing size classes of bull trout. The hypothesis was that smaller fish may not be active migrants (or spawners) like larger size bull trout. That is, smaller bull trout (350mm to 450mm) may represent immature fish that are present in the Eagle Cliffs area due to the presence of abundant forage, cool water, and other bull trout. To test this hypothesis, bull trout less than 450mm were given a different colored tag (red/green bi-color) than individuals larger than 450mm (yellow). Thus, these two different colored tag groups would allow distinction of size classes and migration patterns of bull trout if encountered during snorkeling recapture surveys above the staging area.

Six of the captured bull trout were too small (less than 14 inches) to safely tag with a Floy® tag, five were current year recaptures, two were known tag losses, and one was a mortality (Appendix A). In addition to the five current year recaptures, thirty captured bull trout had Floy® or PIT (Passive Integrated Transponder) tags from previous years bringing the total capture rate of previously handled fish to forty percent (35 fish of a total of 88 fish). All newly captured fish received a Floy® and PIT tag to uniquely identify each bull trout for future reference and all captured fish were weighed and measured to fork length. The weighing of fish was new in 2008 and, along with fork lengths, will be used to assess the condition factor (K-factor) of bull trout residing in Swift reservoir. This biological information will be recorded with each fish captured and individual metrics will be compared with each recapture to evaluate trends in reservoir productivity and how this pertains to bull trout behavior.

SNORKEL SURVEYS:

To satisfy the recapture portion of the mark/recapture estimate, snorkel surveys were conducted on Rush and Pine creeks between August 13, 2008 and October 8, 2008 (Map 3.1-1). Snorkel surveys on Rush Creek include a portion of the North Fork Lewis River known as the "Rush Creek hole". This area is thought to be used as a staging area for bull trout ascending Rush Creek and is about 200 feet long, 40 feet wide, and 10 feet deep. It is located at the confluence of Rush Creek and the North Fork Lewis River. Bull trout counts in Rush Creek occur within two index areas, one from the mouth (including the Rush Creek Hole) upstream to the Forest Service Road (FR) 90 Bridge and the other for about 1000 meters upstream from the FR 90 bridge (about RM 0.85). On Pine Creek, surveys are divided into three index areas where counts were typically conducted between RM 2.0 and 4.5. Surveys on Pine Creek are limited due to inaccessibility.

During each snorkel survey all encountered bull trout are enumerated. Care is also taken to try and determine the presence of any yellow and red/green Floy® tagged fish. Of the eleven red/green tagged fish (comprising of bull trout between 350-450mm), one fish was observed in the mainstem Lewis River directly upstream from the confluence of Pine Creek. This was the only red/green tagged bull trout encountered during any snorkel survey in 2008 (Table 3.1-1).

For 2008, 380 adult bull trout (95% CL) were estimated to be migrating upstream from Swift reservoir to the North Fork Lewis River or its tributaries (Figure 3.1-1 and Table 3.1-2).

Figure 3.1-1. Estimate of bull trout that ascended from Swift Reservoir to migrate up the North Fork Lewis River or its tributaries for the years 1994 through 2008. (Source: Jim Byrne, WDFW)

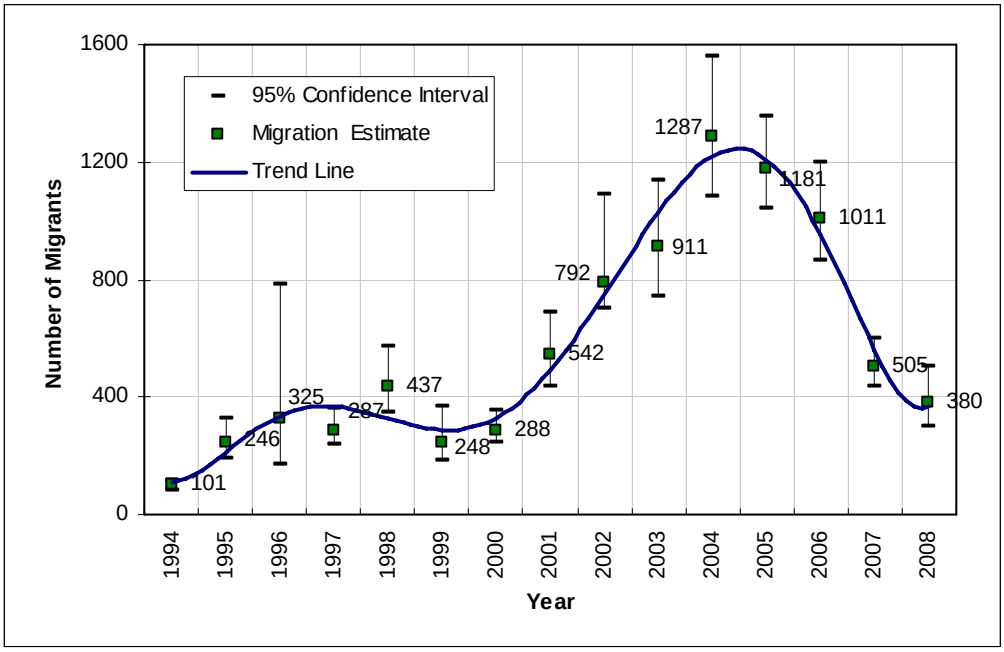
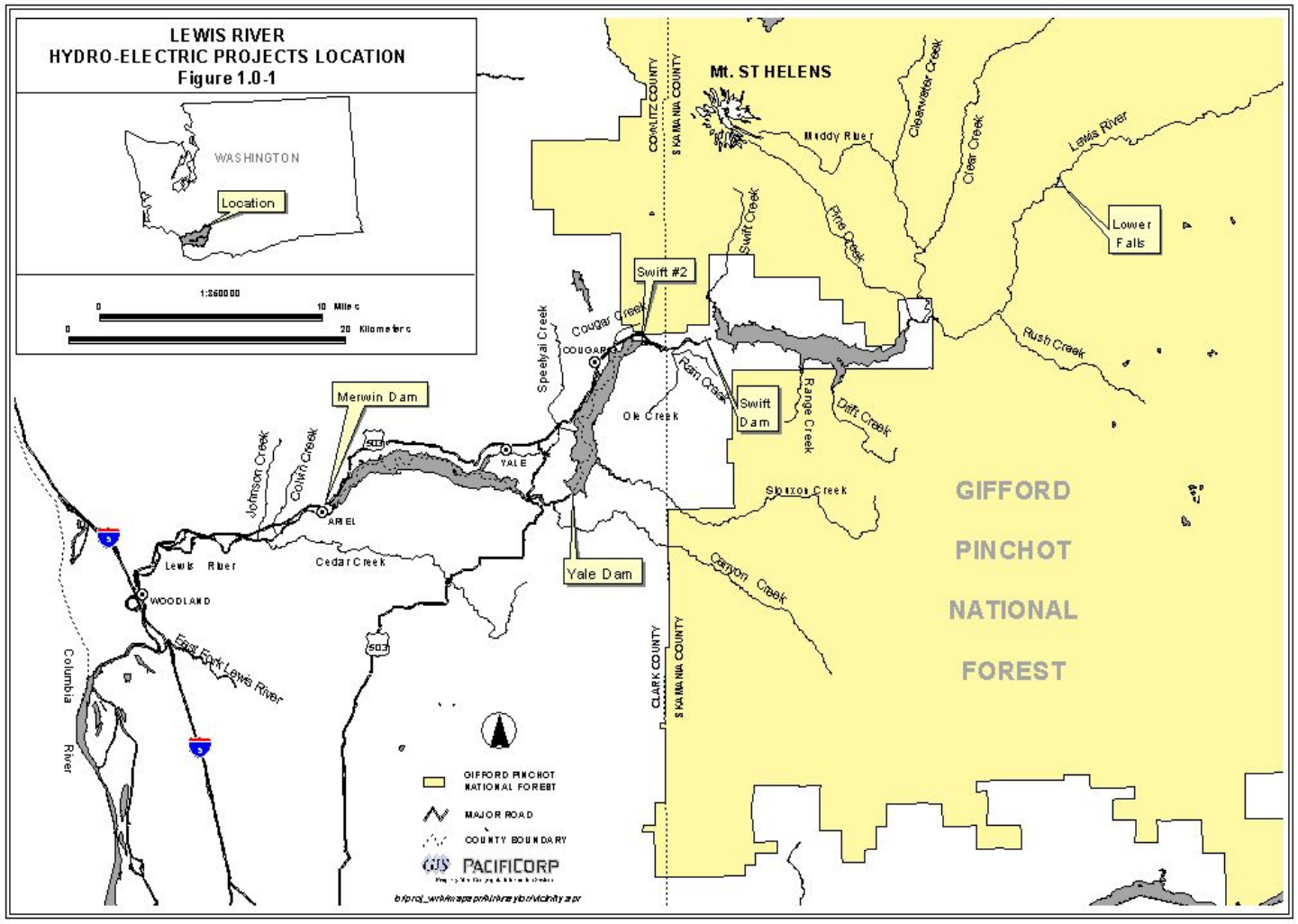


Table 3.1-1. 2008 bull trout snorkel survey results (recapture)

Survey Date	Number of Bull Trout Observed				Total
	Rush Creek		Pine Creek		
	Tagged	*Untagged*	*Tagged*	*Untagged*	
13-Aug	13	39			52
27-Aug			2	7	9
28-Aug	8	53			61
4-Sep			1	11	12
18-Sep	10	52			62
1-Oct			4	15	19
8-Oct	1	5			6
TOTAL	32	149	7	33	221
Source: Jim Byrne WDFW					



Map 2.0-1. Map of North Fork Lewis River study area.

Map 3.1-1. Snorkeling index sites on Pine and Rush Creeks used in conjunction with mark/recapture activities.

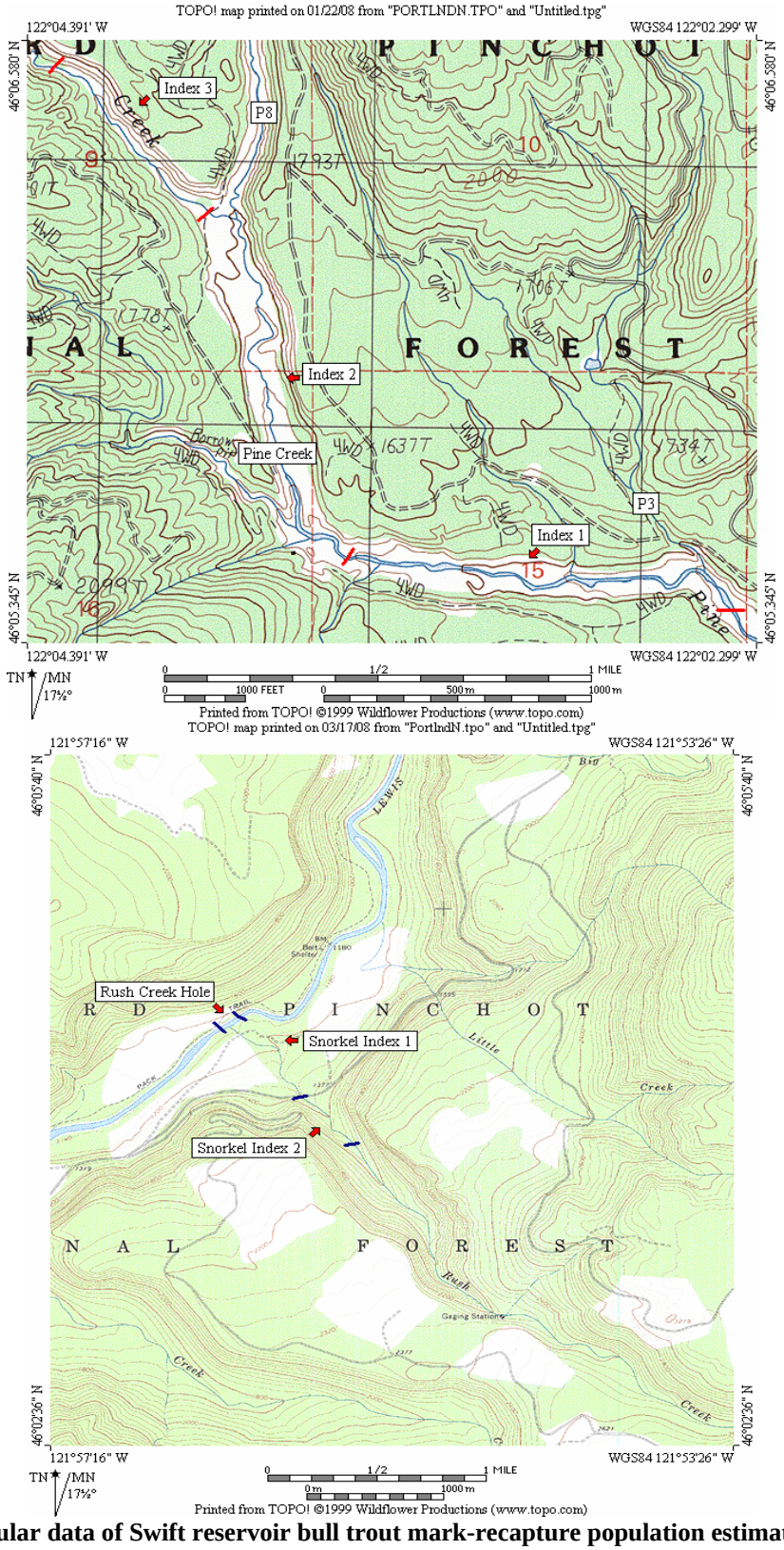


Table 3.1-2. Tabular data of Swift reservoir bull trout mark-recapture population estimates for

1994 - 2008. (Source: Jim Byrne, WDFW)

Year	Lower Bound (95% CL)	Upper Bound (95% CL)	Spawning Population Estimate
1994	85	118	101
1995	193	326	246
1996	173	782	325
1997	235	361	287
1998	345	571	437
1999	181	365	248
2000	242	352	288
2001	439	689	542
2002	701	1092	792
2003	745	1140	911
2004	1084	1556	1287
2005	1042	1354	1181
2006	865	1198	1011
2007	436	596	505
2008	298	507	380

3.2 YALE TAILRACE SAMPLING AND TRANSPORTATION

The Utilities, in cooperation with the WDFW and USFWS, annually net and transport bull trout from the Yale powerhouse tailrace (upper Merwin reservoir) to the mouth of Cougar Creek, a Yale reservoir tributary. A total of 129 bull trout have been captured from the Yale tailrace since the program began in 1995.

To capture bull trout from the Yale tailwaters, monofilament or multi-filament mesh gill nets are used (typically 2.5 to 3 inch stretch). Netting occurs on a weekly basis beginning in June and ending in August. Netting usually occurs between the hours of 0900 and 1200. During this time, the powerhouse generators are taken off-line to facilitate deployment and handling of the nets. Nets are tied to the powerhouse wall and then stretched across the tailrace area using powerboats. The nets are then allowed to sink to the bottom. Depending on conditions or capture rate, the nets are held by hand on one end or allowed to fish unattended. The maximum time nets are allowed to fish is 10 minutes or less.

Upon capture of a bull trout, fish are immediately freed of the net (usually by cutting the net material) and placed in a live well. In years past, captured fish were only measured and inserted with a uniquely colored Floy® tag. New in 2008 was the addition of PIT tagging and weighing of captured fish. Bull trout were PIT tagged so as to allow recognition of captured individuals in the event the Floy® tag is dislodged and the fish is recaptured at a later date. As in Swift reservoir, all captured bull trout were also weighed with a hand-held scale. The scale was attached to a net, allowed to tare to 0, and then the captured fish was placed in the net and weighed. Along with fork length information, the weights of captured bull trout will be used to assess the condition factor (K-factor) of fish residing in Lake Merwin.

Once biological information is gathered and tags are inserted, the bull trout is placed in a six-inch diameter rubber tube that is partially filled with water. A rope is tied to the tube, which allows hatchery crews on the powerhouse deck to hoist the bull trout out of the tailrace area and into hatchery fish transport trucks. The entire process, from capture to hatchery truck, takes only a few minutes and no direct mortality has ever been observed.

Use of Alternative Capture Methods

Pursuant to FERC license Article 401(b) and the Lewis River Settlement Agreement (SA) section 4.9.2; PacifiCorp continues to seek more effective and less intrusive methods to collect bull trout from the Yale tailrace. Past alternative methods investigated include; beach seines, purse seines, drifting of tangle nets when the powerhouse is online, and hook & line techniques.

In 2008 tangle nets and hook and line were the only methods used and, to date, tangle nets remain the most effective. Currently PacifiCorp is investigating the feasibility of a floating upstream collector to trap and transport bull trout from the Yale tailrace. The upstream collector is currently in the conceptual phase (pending results from a similar trap on the Clark Fork, Idaho) and will not be employed for the 2009 season.

Yale Netting Results

At the Yale tailrace, eight capture attempts were completed from June 19, 2008 through August 6, 2008. A total of fifteen bull trout were captured in the tailrace, transported, and then released into Cougar Creek. Other species captured, in order of frequency, included kokanee (*Oncorhynchus nerka*), largescale suckers (*Catostomus macrocheilus*), northern pikeminnow (*Ptychocheilus oregonensis*), mountain whitefish (*Prosopium williamsonii),* coho (*O. kisutch),* coastal cutthroat (*O. clarkii*), rainbow trout (*O. mykiss*), and spring Chinook (*O. tshawytscha*) all of which were returned to the tailrace. No bull trout mortalities were observed as a result of netting and transportation activities. Biological information and release information of the captured bull trout is shown in Table 3.2-1.

Of the one hundred twenty-nine bull trout captured from the Yale tailrace, ninety-nine have been transported to the mouth of Cougar Creek since 1995 (Table 3.2-3). While the intent is to release all fish into Yale reservoir, some bull trout have been released back into Merwin reservoir due to the sonic tracking study, part of mark/recapture studies, or because bull trout were caught during testing of collection methods when no transportation vehicles were available. The contribution of transported bull trout to Cougar Creek's spawning escapement is summarized in Table 3.2-2. Of the fifteen fish released in Yale reservoir in 2008, one bull trout (with yellow/green bi-color Floy® tag) was observed during annual spawning surveys on Cougar Creek in September thru November (see section 3.5).

TABLE 3.2-1: Biological and tag information of captured bull trout netted in the Yale Tailrace – 2008

Date	Tag #	Tag Color	PIT #	Fork Length (mm)	Weight (grams)	Comments
6/19/2008	0001	Yellow/green bi-color	985121012736452	365	626	Water temp. 10°C. Caught via hook & line, new bite wound to ventral area.
6/19/2008	0002	Yellow/green bi-color	985121012653443	413	821	Healthy Fish
6/19/2008	0003	Yellow/green bi-color	985121012655977	395	649	Healthy Fish
6/19/2008	0004	Yellow/green bi-color	985121012609398	450	1220	Healthy Fish
6/26/2008	0005	Yellow/green bi-color	985121012726802	395	767	Healthy Fish, captured whitefish 312mm
7/3/2008	0006	Yellow/green bi-color	985121012645857	440	735	LP gone/water temp 11.5°C
7/3/2008	0007	Yellow/green bi-color	985121012722258	465	1161	Healthy fish
7/3/2008	0008	Yellow/green bi-color	985121012610730	415	626	captured via hook & line, healthy
7/11/2008	0009	Yellow/green bi-color	985121012610175	375	626	Healthy fish
7/17/2008	0010	Yellow/green bi-color	985121012645476	372	481	Healthy fish. Water temp 12°C
7/24/2008	0011	Yellow/green bi-color	985121012742843	430	n/a	Healthy fish - Water temp 13°C - No scale for weight
7/24/2008	0012	Yellow/green bi-color	985121012609337	410	n/a	Healthy fish
7/24/2008	0013	Yellow/green bi-color	985121012762089	398	n/a	Healthy fish
7/24/2008	too small		985121012747328	310	n/a	Healthy fish, too small for Floy® tag
7/31/2008	too small		985121012653305	349	426	Healthy fish, water temp 12°C
8/06/2008	No bull trout captured					

TABLE 3.2-2. Contribution of Merwin bull trout transported to Cougar Creek: 1995-2008

YEAR	Bull trout escapement into Cougar Creek^	Number of bull trout released	Number of bull trout observed with Yale tailrace tags during surveys*								Proportion Estimate of Merwin bull trout transported to Yale that ascend Cougar Creek**
			Chart.	Orange	White	Yellow	Blue	Pink	Yellow/Green bi-color	Green	
1995	7	9				2					22%
1996	11	13				1					8%
1997	14	10				2		1			10%
1998	7	6				2				2	33%
1999	9	0									n/a
2000	9	7						1			14%
2001	9	0									n/a
2002	15	5				1					20%
2003	21	8					1				13%
2004	18	3			1						33%
2005	31	5		1	1						20%
2006	26	5								1	20%
2007	38	13	1								7%
2008	60	15	1						1	1	6%

NOTES:

* Orange = 2005; White= 2004; Blue = 2003, Yellow = 1995, 1996, 1998, 2002; Pink =1997, 2000; Green = 1997,2006; Chartreuse = 2007; Yellow/Green bi-color = 2008

** Estimate is based only on year of release and only on tags observed. As a result, the estimate is considered the lowest percent contribution possible.

^ 1995-2006 bull trout escapement estimates represent peak counts plus any mortalities or tagged fish observed that are not represented in the peak count. 2007-present bull trout escapement estimates represent redd count expansion numbers of 2 fish per redd observed.

TABLE 3.2-3. Number of bull trout collected from Yale tailrace (Merwin reservoir) and transferred to the mouth of Cougar Creek (Yale tributary): 1995 – 2008.

YEAR	No. captured at the Yale tailrace	No. transferred to mouth of Cougar Creek	No. released back into Merwin reservoir.	MORTALITIES
1995	15	9	6	0
1996	15	13	2	0
1997	10	10	0	0
1998	6	6	0	0
1999	6	0	6	0
2000	7	7	0	0
2001	0	0	0	0
2002	6	5	1	0
2003	19	8	1	10^
2004	8	3	5*	0
2005	5	5	0	0
2006	5	5	0	0
2007	13**	13**	0	0
2008	15	15	0	0
TOTAL	**129**	**99**	**21**	**10**

* Represents fish tagged with sonic tags and released in Speelyai Bay rather than transported to Cougar Creek (exception: one fish was a recapture from 2003; Sonic tag 444 which was released into the Yale tailrace upon capture). ^ Please refer to 2003 annual report for

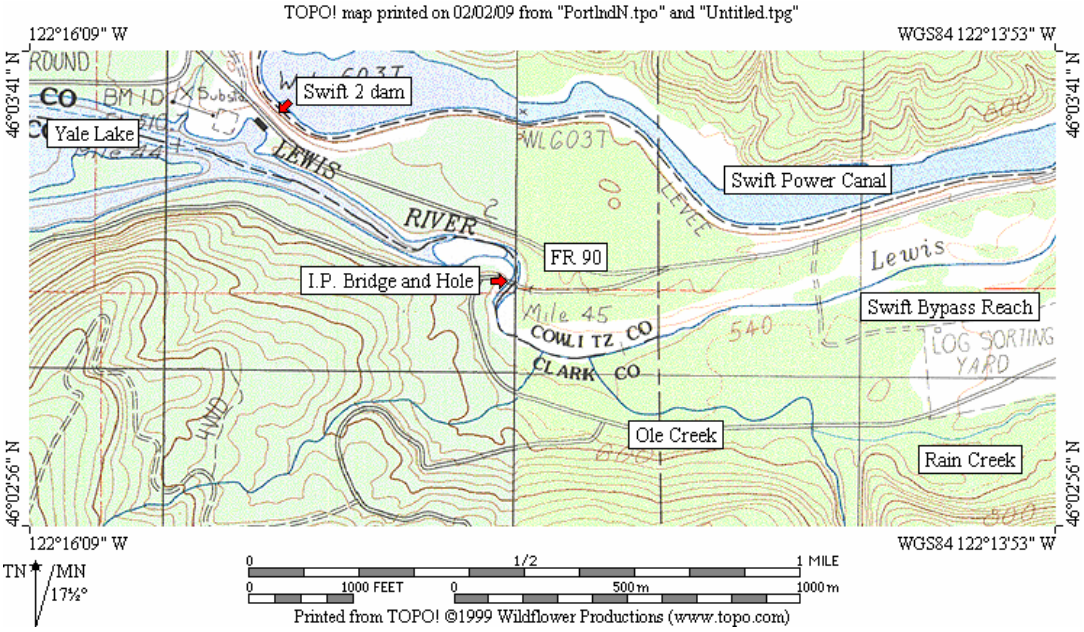
description of mortalities. ** Includes addition of one recapture from previous years netting activities, but not included in running total (of 114) because it was already added from previous year.

3.3 SWIFT BYPASS SURVEYS

The Swift Bypass Reach is the former Lewis River channel (bypass) between the Swift No. 1 and Swift No. 2 hydroelectric projects. Since 2002 a minimum flow of 47 cfs has flowed in the Bypass Reach through what is termed the "power canal drain". The drain flows into a 0.21 mile long reach (Lower Release or "Constructed" Channel) that is relatively unaffected by Swift No. 1 spill events. This channel then joins the main channel Bypass Reach and, along with Ole Creek, provides most of the flow into the lower Bypass Reach.

3.3.1 BULL TROUT CAPTURE AND MARKING ACTIVITIES IN THE INTERNATIONAL PAPER (I.P.) POOL OF THE SWIFT BYPASS REACH

In 1999, The Utilities began netting the Swift No. 2 tailrace as part of requirements contained in amendments to Article 51 of the Merwin license. The tailrace was not netted from 2001 to 2005 because of the Swift No. 2 canal failure in 2001 and subsequent reconstruction. Capture efforts were restarted in 2006. Due to the extremely low capture rates at Swift No. 2 tailrace (two fish in 1999 and none since then) the Utilities proposed in 2007 during the annual bull trout monitoring coordination meeting that USFWS consider discontinuing Swift No. 2 tailrace netting in lieu of netting the area under the I.P. bridge over the Swift Bypass Reach termed the "I.P. pool" (Map 3.3-1). As noticed in past Swift Bypass Reach snorkel survey data, the I.P. pool was found to hold many adult bull trout between the months of June thru October. The Utilities proposed sampling of the I.P. pool using beach seines, monofilament tangle nets and hook and line techniques. After capture and recording of biological data each bull trout would be inserted with a uniquely colored Floy® tag and PIT tag thus allowing the recognition of these fish if encountered in subsequent surveys of the bypass reach, Yale reservoir or, its tributaries. The USFWS and those in attendance at the 2007 coordination meeting approved this methodology.



Map 3.3-1. Map showing bull trout sampling areas within Swift Bypass Reach

The I.P. pool was sampled five times from June 13 to August 26, 2008, and nine bull trout were captured. Of these, four were newly captured, three were present year recaptures and two were recaptures from 2007 (Table 3.3-1). After tagging and recording biological information, all fish were immediately returned to the area where captured. Thus, no area was sampled more than twice in one day in order to reduce potential stress to the fish from possible recapture. As in other monitoring programs, weights of captured bull trout were also recorded to assess the K-factor of bull trout residing in Yale reservoir. Other species captured in order of frequency included largescale suckers, mountain whitefish, coastal cutthroat, rainbow trout, and spring Chinook.

During annual bull trout redd surveys performed on Cougar Creek in the fall; surveyors take care to notice any Floy® tagged fish. The contribution of Swift Bypass Reach tagged bull trout to the Cougar Creek spawning escapement is assessed in Table 3.3-2.

Table 3.3-1: Capture information of bull trout netted in the I.P. pool – 2008

Date	Tag #	Tag Color	PIT#	Fork Length (mm)	Weight (grams)	Comments
6/13/2008	001	Blue/orange bi-color	985121012651854	614	2413	Recap of 2007 pink tag #105. 602mm on 08/07/2007
7/01/2008	R	Blue/orange bi-color				Recap of blue/orange tag #001
7/01/2008	002	Blue/orange bi-color	985121012737167	445	907	Healthy fish
7/01/2008	003	Blue/orange bi-color	985121012648125	501	1275	Healthy fish

7/15/2008	R	Blue/orange bi-color				Recap of blue/orange tag #002. Water temp 11.5°C
7/15/2008	004	Blue/orange bi-color	985121012738119	638	2862	Recap of 2007 pink tag #103. 565mm on 07/17/2007.
7/15/2008	005	Blue/orange bi-color	985121012746177	642	n/a	Healthy fish
8/20/2008	R	Blue/orange bi-color				Recap of blue/orange tag #002. Water temp 12.5°C
8/20/2008	006	Blue/orange bi-color	n/a	415	567	Skinny fish, exhibiting vibrant spawning colors
8/26/2008	No bull trout captured					Water temp 13°C

Table 3.3-2: Contribution of Swift Bypass Reach tagged fish to Cougar Creek spawning escapement.

Year	Bull trout escapement into Cougar Creek^	Number of bull trout released	Number of bull trout observed with Swift Bypass Reach tags during surveys*		Proportion Estimate of Swift Bypass Reach tagged bull trout that ascend Cougar Creek**
			Pink	Blue/Orange bi-color	
2007	38	14	4		28%
2008	60	6	1	1	16%
* Pink = 2007; Blue/Orange bi-color = 2008					
** Estimate is based only on year of release and only on tags observed. As a result, the estimate is considered the lowest percent contribution possible.					
^Bull trout escapement estimates represent redd count expansion numbers of 2 fish per redd observed					

3.3.2 BASELINE ASSESSMENT OF THE CONSTRUCTED CHANNEL OF THE SWIFT BYPASS REACH

On July 28, and 29, 2008 the Constructed Channel, from the Power canal drain to the Swift Bypass Reach was electrofished using single-pass methodology in conjunction with block nets. (Map 3.3-2). The survey was conducted by two biologists and the electroshocker was set at the lowest possible settings following USFWS bull trout electrofishing protocols and WDFW backpack electrofishing guidelines to minimize any harmful effects.

During Lewis River Settlement Agreement (SA) discussions, the Constructed Channel was identified as a location for habitat improvement projects as a means of mitigation for loss of habitat due to Lewis River hydroelectric operations. Pursuant to section **6.1.3** of the **SA**, habitat improvement work is scheduled to begin on the Constructed Channel in the summer of 2009.

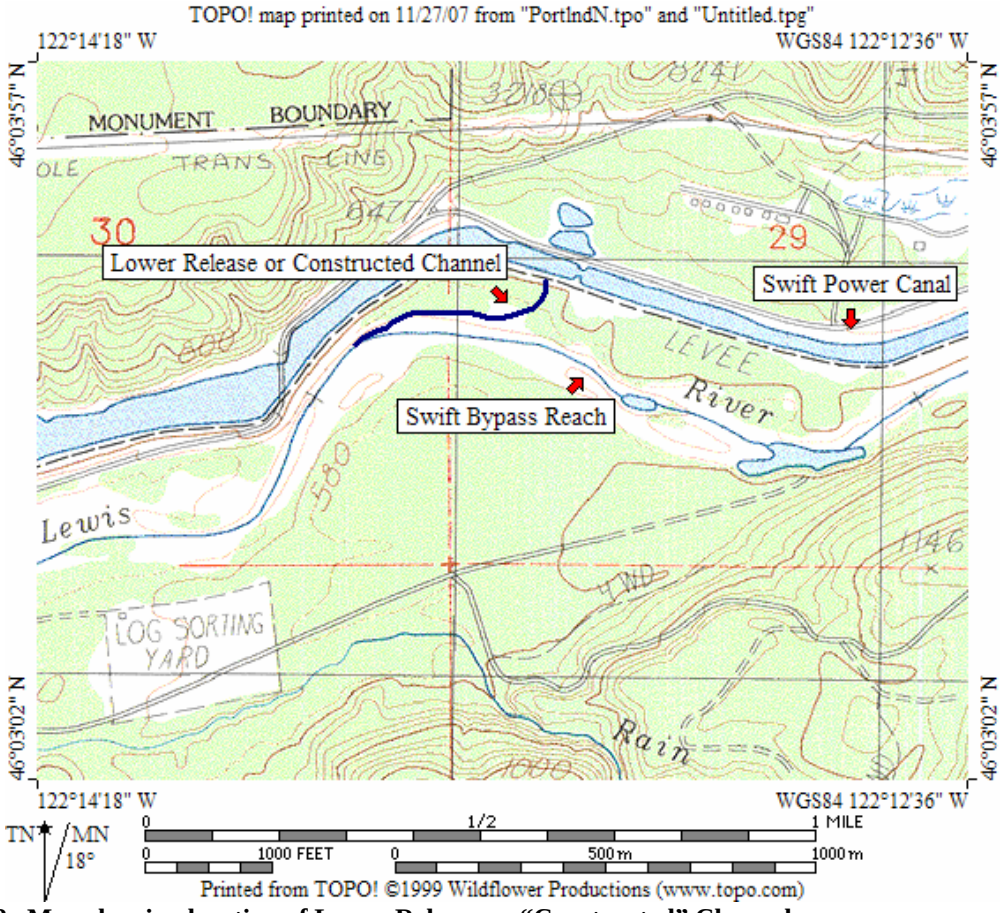
This is the second year of a two-year study to collect baseline fish distribution, relative abundance and species composition data in the channel. This information will help to evaluate

benefits from the planned habitat improvements to species using the channel. The 2008 survey activities were replicated, as near as possible, to activities performed during surveys in 2007.

On July 28, 2008 the mouth of the channel was block-netted to satisfy the closed population assumption required to run a mark/recapture population estimate. The stream was then electrofished from the mouth to the Power Canal drain. A total of forty-four coastal cutthroat and mountain whitefish ranging in size from 68 mm to 440 mm were captured. In 2007 captured fish were marked by removal of the adipose fin, in order to eliminate any potential bias from recapturing these fish. The 2008 captures were marked by clipping the upper lobe of the caudal fin. Marked fish were then returned to the stream (Appendix E). Water temperature at the time of the survey was 10.5° C and the flow was estimated to be 47 cfs. The block-net was kept in place overnight to insure that marked fish could not emigrate and new fish migrate into the system.

On July 29, 2008, PacifiCorp biologists again electrofished the Constructed Channel from the mouth to the Power Canal drain to complete the "recapture" portion of the mark/recapture survey. Thirty-seven coastal cutthroat trout, rainbow trout, mountain whitefish, and brook trout (*S. fontinalis)* ranging in size from 74 mm to 400 mm were captured and inspected for clipped caudal fins (Appendix E). The water temperature at this time was 10º C and the stream flow was estimated to again be 47 cfs. Of the fish captured, five were found to be with clipped caudal fins from the previous day's activities.

A simple Modified Peterson equation was then used to obtain an estimate of age 1+ and older fish in the channel. As in 2007, during sampling activities the extreme margins of the stream were not sampled due to the surveyors wanting to minimize any harmful impacts to age 0+ fish that are known to inhabit this specific habitat area. As such this sampling is only representative of age 1+ or older fish. We used the equation $n = ((M+1)(C+1)/(R+1))-1$, where n = population size, M = total number of marked fish, C = total number of fish captured during recapture activities, and R = total number of recaptured marked fish (Seber 1982). Based on this equation, an estimate of n = 284 (age 1+ or older fish) were inhabiting the Constructed Channel at the time of the survey. This number is slightly less than the estimate of n = 304 age 1+ fish or older generated during sampling activities in 2007. These two sets of baseline data will be compared to future data gathered after habitat improvement projects have been completed in the channel.



Map 3.3-2. Map showing location of Lower Release or "Constructed" Channel.

3.3.3 SNORKEL SURVEYS OF SWIFT BYPASS REACH

In addition to the capture activities in the I.P. Bridge pool and Constructed Channel, several snorkel surveys of the Bypass Reach were also conducted by the Utilities and Washington Department of Fish and Wildlife personnel (Table 3.3-3).

During the snorkel surveys, no bull trout were handled. Most 2008 snorkel surveys occurred in the I.P. Bridge pool. Largescale suckers were the dominant species observed during the surveys. Large rainbow, cutthroat trout, and mountain whitefish along with kokanee were also present.

Table 3.3-3. Bull trout observed during snorkel surveys of the Swift Bypass Reach in 2008.

Date	Along FR 90	IP Bridge pool	Tagged Fish	Total bull trout observed
August 7, 2008	1	2		3
September 5, 2008		1		1
October 2, 2008		4	1-chart. 1-pink 1-blue/orange bi-color	4
October 10, 2008		2		2
October 17, 2008		4	1-blue/orange bi-color	4
October 31, 2008		2		2
November 10, 2008		0		0

3.3.4 REDD SURVEYS OF OLE CREEK

Bull trout redd surveys were performed on Ole Creek (Map 3.3-1), a tributary to the Swift Bypass Reach, on five occasions starting October 6, 2008 and ending with a survey on November 10, 2008. Surveys were performed by PacifiCorp and WDFW. Since suitable water temperature during the spawning time is a major habitat limiting factor for bull trout, temperature readings were taken during each survey. Ole Creek water temperature became progressively colder as surveys were completed with readings of 10°C on October 6, 9°C on October 17, and 7.7°C during the final survey on November 10. Ole Creek did not contain flowing surface water at its mouth until the first week of October. Water flow was, most likely, a migration hindrance during all performed surveys. While Ole Creek flow was estimated to be between 1-5 cfs in the month of October, the migration problem occurred mainly where the stream discharged into the Swift Bypass Reach where flow in this portion was subsurface. During the October 17 Ole Creek redd survey, Rain Creek, a tributary to Ole Creek, was also surveyed. The water temperature in Rain Creek was measured at 8°C; the stream itself consisted of a series of pools with no surface water connectivity.

No bull trout or redds believed to be excavated by bull trout were observed during any Ole Creek surveys. Adult kokanee and kokanee redds were observed during every survey with the highest count estimate of kokanee on any given survey estimated to be 200 fish.

3.4 PINE CREEK AND UPPER LEWIS RIVER TRIBUTARY SURVEYS

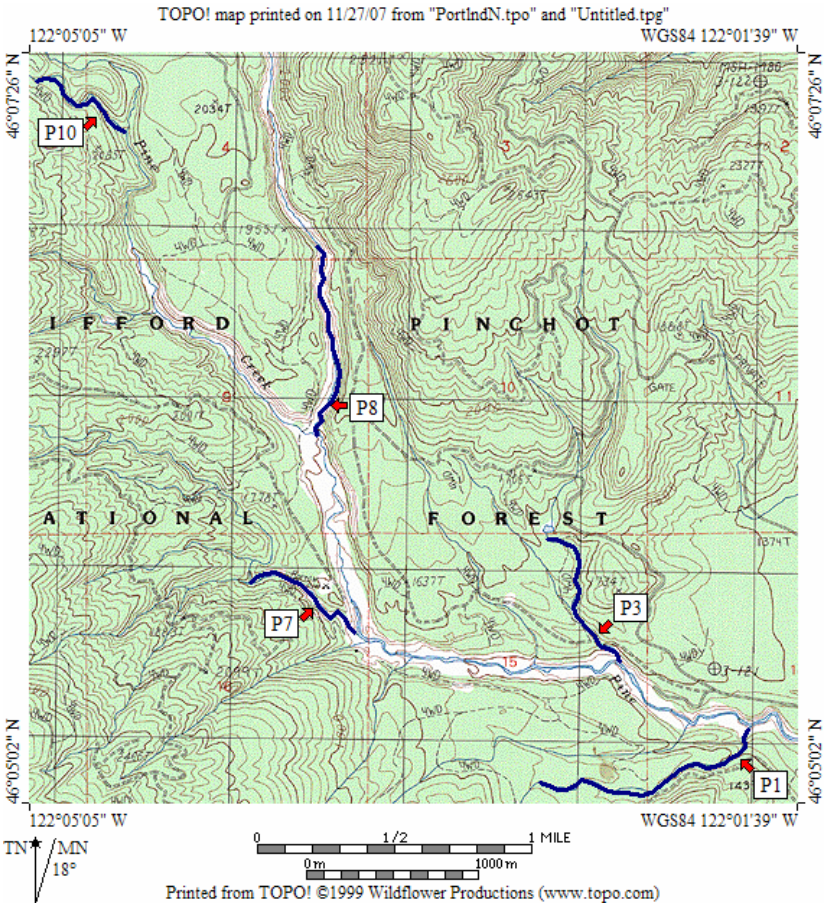
In a continuous effort to locate any additional local populations as well as additional suitable bull trout spawning habitat, PacifiCorp and WDFW conducted several surveys of tributaries to Pine Creek and the upper Lewis River.

In 1999 and 2000, stream surveys were performed on behalf of the Utilities for a report titled *Assessment of Potential Anadromous Fish Habitat Upstream of Merwin Dam,* this report was included in PacifiCorp and Cowlitz PUD's *2004 Technical Study Status Report* (PacifiCorp and Cowlitz PUD 2004). The goal of the surveys was to identify all available anadromous fish habitat upstream of Merwin Dam. On Pine Creek ten tributaries were identified and surveyed in 1999-2000 and five of the ten tributaries were thought to contain suitable habitat for anadromous fish.

Pine Creek has one of the two distinct Lewis River bull trout populations residing within Swift reservoir (the other occurring in Rush Creek), but our knowledge of where within the Pine Creek drainage these bull trout spawn is still extremely limited. Due to the turgid nature of Pine Creek mainstem it is extremely difficult to locate bull trout redds due to the constant stream bed movement, high velocities, and bubble curtains. Therefore the question of if and where bull trout spawn within the Pine Creek mainstem remains unanswered. Based on this, attention has turned to the tributaries of Pine Creek as possible locations for bull trout spawning within the Pine Creek drainage.

According to the anadromous fish habitat surveys performed in 1999 and 2000, Pine Creek tributaries P1, P3, P7, P8, and P10 (Map 2.4-1) were found to hold suitable habitat for larger anadromous fish (PacifiCorp and Cowlitz PUD 2004). In 2007, in an effort to verify bull trout use within these tributaries to Pine Creek, PacifiCorp planned to survey P1, P3, P7, and P10. P8 was not included on this list due to previous capture of a bull trout juvenile in an electrofishing survey by PacifiCorp and WDFW in 2006 (Doyle and Lesko 2007). After further research, P7 was also dropped from the list due to the fact that a bull trout juvenile was captured in 2006 in this stream during an electrofishing survey performed by the WDFW (pers. comm. Jim Byrne WDFW). This left P1, P3, and P10 to be surveyed in the summer of 2007. Before surveys of these streams could be completed, additional new information was obtained from FWS regarding the capture of a bull trout juvenile at the mouth of stream P10. Consequently the planned surveys of stream P10 in 2007 were also cancelled.

Surveys of tributaries P1 and P3 were performed in the summer of 2007. When located, P1 was found to hold no flowing surface water and no surface water connectivity to Pine Creek mainstem. The tributary P3 was found to have an estimated flow of 1 cubic feet per second (cfs) and was electrofished from the mouth to the first anadromous fish barrier. For more information about these surveys please refer to the Utilities 2007 Threatened and Endangered Species Annual Report submitted to the Agencies in March 2008 (Doyle and Lesko 2007). The tributary P3 was scheduled for an additional electrofishing survey in 2008.



Map 3.4-1. Pine Creek tributaries thought to contain anadromous fish habitat.

On August 11, 2008 the Utilities and WDFW electrofished Pine Creek tributary P3 from the mouth to 218 m upstream for bull trout juveniles consistent with the survey performed in 2007. The survey used single-pass electrofishing methods. Water temperature at the mouth of P3 was measured as 11° C and increased to 12°C at the anadromous fish barrier. Unlike the survey performed in 2007 an additional braid in the stream was found. This small side-channel was 93 meters long and was estimated to have 0.5 -1 cfs surface water flow. The main channel comprised the additional 125 m of habitat and its surface water flow was estimated to be between 2-4 cfs.

Using coho criteria, the original stream habitat survey performed on this stream in 1999 found the anadromous fish barrier to be 1,750 meters up from the mouth. During the 2008 survey an anadromous fish barrier was found to be located 125 meters upstream from the mouth. This 2008 barrier was the same as encountered in 2007 and consisted of a six foot vertical falls with a plunge pool depth of less than one foot. According to the report written by Powers and Orsborn (1985), fish need a plunge pool depth of 1.25 x the height of the jump. Therefore for a six foot falls the pool depth would need to be at least 7.5 feet, thus it was concluded that, at normal flows experienced during bull trout spawn times, this falls would be a barrier to bull trout passage.

Nineteen cutthroat were captured in the 2008 electrofishing survey of P3 ranging in size from 40-152 mm. No bull trout were captured or observed.

In addition to the electrofish survey of P3, snorkel surveys were performed on the Muddy River, Cussed Hollow Creek, and Spencer Creek, all tributaries to the upper North Fork Lewis River (Map 3.4-2).

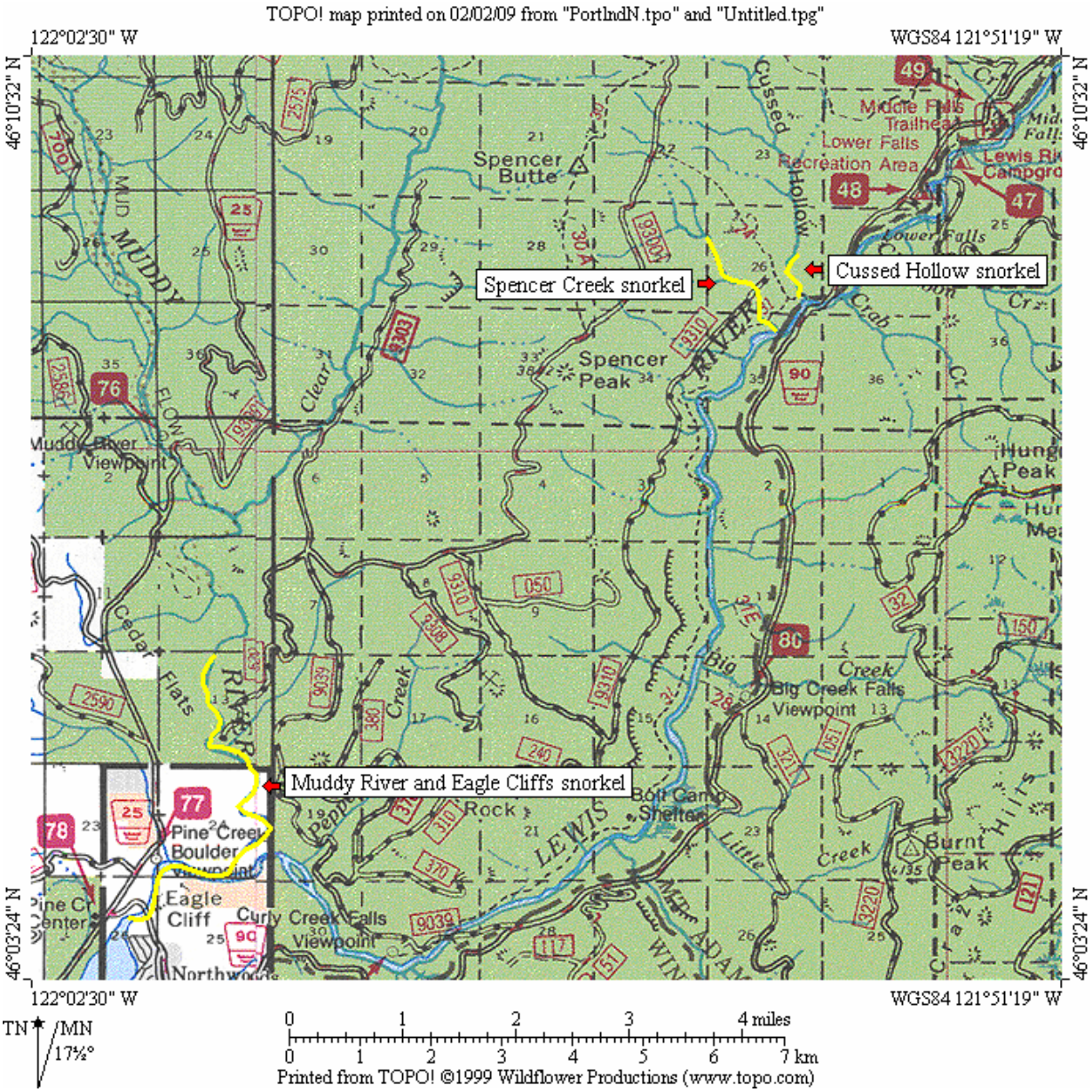
In a report by Clearwater Biostudies, Inc. (2002) for the USDA Forest Service, two tributaries to the mainstem upper Lewis River were found to have water temperatures suitable for bull trout spawning during the tail end of bull trout spawn time. Recent literature suggests that bull trout require less than 11° C to initiate spawning (Fraley and Shepard 1989); both Spencer Creek and Cussed Hollow Creek, according to the above mentioned report, had hourly temperature readings below 11° C by October 1st (Clearwater BioStudies, 2002). These streams were surveyed in 2007, no bull trout were encountered. Surveys performed in 2008 are a continuation of the 2007 surveys with one major difference; unlike surveys in 2007, Spencer Creek and Cussed Hollow Creek were not electrofished in 2008. Also new in 2008 was a snorkel survey of a portion of Muddy River downstream to the head of Swift reservoir in the Eagle Cliffs area.

On October 16, 2008 Spencer Creek was snorkeled from the mouth upstream 1,000 m to where an anadromous fish barrier exists. The water temperature at the mouth was 7° C and the flow was estimated at 5 cfs, water clarity during the survey was excellent. No bull trout or adult coho were observed. A limiting factor to migration up Spencer Creek from the Lewis River mainstem at the time of the survey was that the stream went sub-surface 20-ft before emptying into the Lewis River mainstem.

A snorkel survey was also performed in Cussed Hollow Creek on October 16, 2008 to 150 ft. above the anadromous fish barrier with the intent to search for adult bull trout. Water temperature at the stream mouth was 6° C, streamflow was estimated to be 8-10 cfs and the water clarity was excellent. No bull trout were observed. Two adult coho were observed in the plunge pool directly below the barrier falls with a large redd in the tailout directly below the plunge pool. No coho or bull trout were observed in the 150 ft. snorkeled section above the barrier falls. Two coho adults were observed on a redd in the Lewis River mainstem upstream of the mouth of Cussed Hollow Creek.

A snorkel survey was performed on a portion of the Muddy River on August 15, 2008 by PacifiCorp and WDFW. Three snorkelers, parallel to each other across the width of the stream, began the survey approximately 2 miles upstream from where the Muddy River discharges into the mainstem Lewis River. Four non-Floy® tagged bull trout and one yellow (2008 tagging season) Floy® tagged bull trout were observed in this section of the Muddy River. Stream temperature measurements were taken after the survey was completed where the 25 road bridge crosses the Muddy River. Temperatures near the surface in the thalweg measured 16°C. This snorkel survey was also extended to incorporate the Eagle Cliffs area of the North Fork Lewis River. Eight bull trout were observed in the Eagle Cliffs area. One bull trout was observed directly upstream of the FR 90 Bridge where it crosses the Lewis mainstem

while the other seven bull trout were located below the bridge nearer the influence of Swift reservoir. Of the eight observed bull trout four were estimated to be smaller fish (sub 450mm) and two were Floy® tagged, one with an orange tag (2006 tagging season) and one with a yellow tag (2008 tagging season).



Map 3.4-2. Map showing location of 2008 Muddy River, Cussed Hollow, and Spencer Creeks snorkel survey sites.

3.5 COUGAR CREEK SPAWNING ESTIMATE

Since 1979, PacifiCorp biologists, along with various state and federal agencies, have conducted annual surveys to estimate spawning escapement of kokanee in Cougar Creek. Along with the kokanee, surveyors also count the number of bull trout observed within the creek. In 2008 the Utilities conducted eight Cougar Creek surveys. PacifiCorp and WDFW personnel also conducted several snorkel surveys of the creek. The 2008 bull trout count is based on information obtained from foot, redd, and snorkel surveys.

Based on the presence and detection of multiple bull trout redds in Cougar Creek since 2006, redd count spawning population estimate methodology has become the main source for the annual Cougar Creek bull trout spawner abundance estimate. Bull trout redd surveys were conducted in Cougar Creek weekly from September 15, 2008 to November 6, 2008. Surveys begin at the mouth of the creek and commence at the creek's spring source, a distance of app. 1.3 miles. Though redd count methodology has effectively replaced live peak counts as the metric used to estimate spawner abundance, peak counts are still performed during redd surveys in order to continue this established trend for comparison and calibration for the new method.

Due to the wide range use of redd counts as a bull trout spawner abundance metric, multiple studies have questioned the accuracy of redd counts as a population estimator especially when indices or multiple observers are used when surveying large streams and drainages (Dunham et al. 2001, Muhlfeld et al. 2006). Indices are questioned based on the reliance that fish come back to the same area at the same time every year to spawn. Also, the use of multiple and different observers is considered inaccurate based on the variability between observers associated with redd surveys. The methodology employed within Cougar Creek differs from most large-scale redd surveys in that the stream is small enough to have the entire length surveyed and currently is the only known bull trout spawning stream in Yale Lake, thus increasing the reliability of this technique.

Two biologists, one on each stream bank, survey the entire 1.3 miles of Cougar Creek. This precludes the spatial questions encountered when breaking a large system into sampling indices. Weekly surveys are completed over an extended period of time to address potential error associated with spawn timing. Surveys are completed until no fish and no new redds are observed for two consecutive weeks. To alleviate inter-observer variability, surveys are performed by the same experienced samplers every week, Dunham et al. (2001) specifies that investigators should not rely on indices and should use the same surveyors as an effective way of improving the reliability of redd counts.

The real challenge of using redds to quantify a spawning population size lies in determining the relationship between redd counts and actual numbers of fish (Budy et al. 2003). Much research has been conducted that attempts to correlate the number of spawning adult bull trout per redd. Baxter and Westover (2000) used a weir on a fluvial and adfluvial population of bull trout on the Wigwam River in Canada and estimated the ratio to be 1.2 fish to 1 redd, Sankovich et al. (2003) using a weir, estimated a ratio of 2.1 to 1 for a fluvial and resident bull trout population on the Walla Walla River. Ratliff et al. (1996) using a weir and subsequent

redd counts on an adfluvial bull trout population, found the ratio on the Metolius River to be 2.3 fish to 1 redd, while Taylor and Reasoner (2000) using a weir with a fish counter on an adfluvial population of bull trout in the McKenzie River had estimates of 3.5 and 4.3 fish for each redd. It seems that the number of bull trout per redd is most likely basin or watershed specific and highly variable.

At this time, given that the exact number of bull trout that ascended Cougar Creek to spawn is unknown, there is no reliable way to get an approximate number of fish per redd. A weir was attempted in Cougar Creek in 1996 but subsequently failed. Starting in 2007 and continuing in 2008, an underwater video camera has been installed to visually count adult bull trout as they migrate upstream and downstream. Data from the underwater video camera is still being processed at this time, so it remains to be seen if this will be an effective way at capturing true fish numbers in Cougar Creek. Therefore, until we are able to get true numbers of adult bull trout spawners that enter Cougar Creek either through the use of a weir, fish counter, or underwater video technology, PacifiCorp has elected to temporarily adopt two fish per redd as the index until numbers can be verified.

Prior to each survey, a stream gage reading was taken at the bridge. New redds were flagged and identified by GPS coordinates with the date, location of redd in relation to the flag, and GPS coordinates written on the flagging. Subsequent surveys inspected the redd to see if it was still visible. If the redd was still visible that information was written on the flagging with the date, until the redd was no longer visible at which time this was noted on the flagging. Biologists also counted any bull trout observed within the vicinity of each redd. Throughout the spawning season, new redds were flagged and identified as described above until no bull trout adults and no new redds were observed in Cougar Creek for two consecutive weeks.

Twenty-nine individual bull trout redds were observed in Cougar Creek in 2008. Using the two fish per redd expansion, fifty-eight spawning bull trout were believed to have ascended Cougar Creek in 2008 (Figure 3.5-1). The first recorded redd was observed on September 15, 2008 and the last new redd was observed on November 6, 2008. The bulk of redd construction occurred during the two week span between October 4 – October 21 when 15 new bull trout redds were counted. The peak count of six new redds occurred during the October 21 survey.

All bull trout redds were observed in the upper half of the creek above a log jam that on most years is impassable to kokanee. Kokanee are also actively spawning within Cougar Creek during the same time period. This is not to say that bull trout did not spawn in the lower reaches of Cougar Creek, the lower portion of the creek was surveyed intensively but due to the amount of spawning kokanee it is nearly impossible to say whether a redd of appropriate size is a bull trout redd or many kokanee redds superimposed upon one another.

For the first time since 2005 kokanee were observed above the normally impassable log jam, and subsequently one bull trout redd was later found to be superimposed by spawning kokanee. Based on a study by Weeber (2006), there is limited concern over kokanee superimposing bull trout redds, as he found that kokanee were not able to dig deep enough to affect incubating bull trout eggs. A recent concern though, observed for the first time in 2008,

was the observation of bull trout redds found to be superimposed over one another. Bull trout redd #3 was first observed on September 15, over a month later during a survey on October 21 redds #21 and #24 were found to be superimposed over a portion of it. Also during the same October 21 survey, redd #22 was found to be superimposed on redd #2 which was first observed along with redd #3 on September 15. All of these redds were constructed in the same small spatial area along the margin of a tailout.

Flagging from redd surveys performed in 2007 was left in place over the course of the year and along with GPS coordinates, care was taken to document redd habitat areas used consecutively from the previous year. It was found that eleven of the twenty-nine redds (38%) were constructed very near and sometimes in almost the exact spots as the previous year. This information prompted surveyors to collect data documenting the habitat parameters for redd construction by bull trout. During the course of redd surveys, biologists documented the water depth over the redd egg pocket, water velocity over the redd egg pocket (feet per second), length and width of redd pocket and pit, location of redd in relation to the stream, location of the redd in relation to any large wood, and the size of gravel present in the redd. This information will continue to be collected in 2009 to standardize bull trout redd habitat attributes in Cougar Creek, this data can then be used in the future to evaluate superimposition of bull trout redds when anadromous salmon and steelhead are also spawning in the stream.

Along with redd counts a peak visual count of bull trout was also performed as it has since 1979 (Figure 3.5-1). This count is not considered a spawning population estimate as it relies on a peak count of bull trout observed on a single day. Rather, the annual peak counts are used to monitor Cougar Creek bull trout trends from year to year. In 2008 combined snorkel and foot surveys, the peak count was forty adult bull trout. This number comes from a peak snorkel count of thirty-seven adult fish observed, plus the addition of a chartreuse tagged fish (transported from Merwin in 2007), a green tagged fish (2006 Merwin transport) and an orange/blue tag (Swift Bypass Reach 2008 tagging activities) not observed on the snorkel survey, but observed on a subsequent redd survey. During the peak snorkel count, two out of the thirty-seven fish observed had a Floy® tag, one yellow/green tag (2008 Merwin transport) and one pink tag (Swift Bypass Reach 2007 tagging activities). Yale Lake bull trout use of the Swift Bypass Reach and Cougar Creek will continue to be monitored in future surveys. The estimate of forty bull trout is considered to be the minimum number of bull trout that ascended Cougar Creek in 2008.

Also during the peak snorkel count, ten juvenile bull trout, estimated to be between 70-180mm fork length (FL), were observed “schooled” up with approximately twenty cutthroat of like size-class under a downed log in the upper portion of Cougar Creek. Juvenile bull trout are rarely encountered during day snorkels anywhere in the Lewis River Basin and when observed there is usually just a single fish.

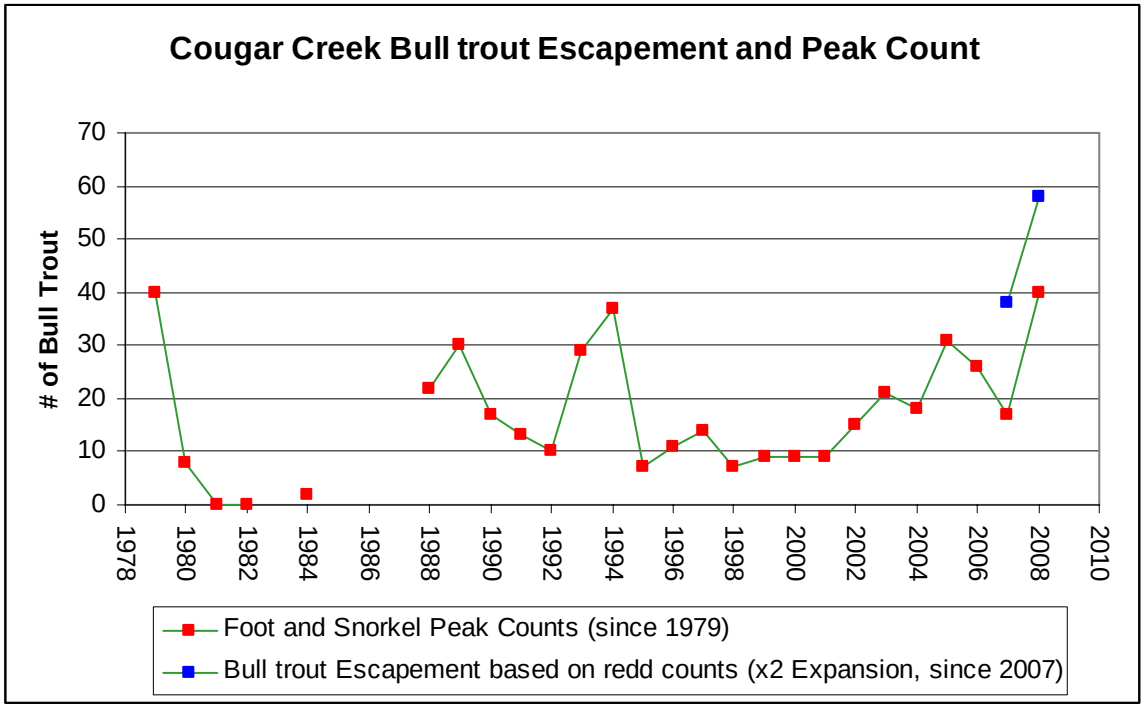


Figure 3.5-1. Annual spawning escapement based on redd surveys and peak counts during foot and snorkel surveys of bull trout observed in Cougar Creek 1979-2008.

3.6 Rainbow Trout Stomach Content Analysis

One hundred twenty-five rainbow, cutthroat, whitefish, and coho were sampled for their stomach contents (Figures 3.6-1 through 3.6-4) during the 2008 Swift reservoir bull trout netting activities. The primary purpose of this activity was to document if hatchery rainbow trout planted into Swift reservoir prey upon ESA listed juvenile bull trout in the Eagle Cliffs area of the reservoir. A secondary objective was to determine the diet composition of fish in different locations within the basin. This is an ongoing evaluation and will continue in 2009.

Of all the rainbow trout sampled, none were found with juvenile bull trout in their stomachs. Stomach contents of rainbow trout in the Eagle Cliffs area were dominated by Ephemeroptera, detrital material, and Hymenoptera. Insects were only classified to Order to get a general understanding of what the primary food bases are in the Eagle Cliffs area. Hymenoptera were primarily ants. The only fish identified in a rainbow trout stomach was a sculpin *(Cottus ssp.)*. Fish or fish bones were identified in two samples from coastal cutthroat. A cutthroat stomach sample from Yale tailrace was found with the dentary bone of a northern pikeminnow (*Ptychocheilus oregonensis)* and a stomach sample from a cutthroat netted from the Eagle Cliffs area of Swift reservoir held a large (app. 60mm) sculpin.

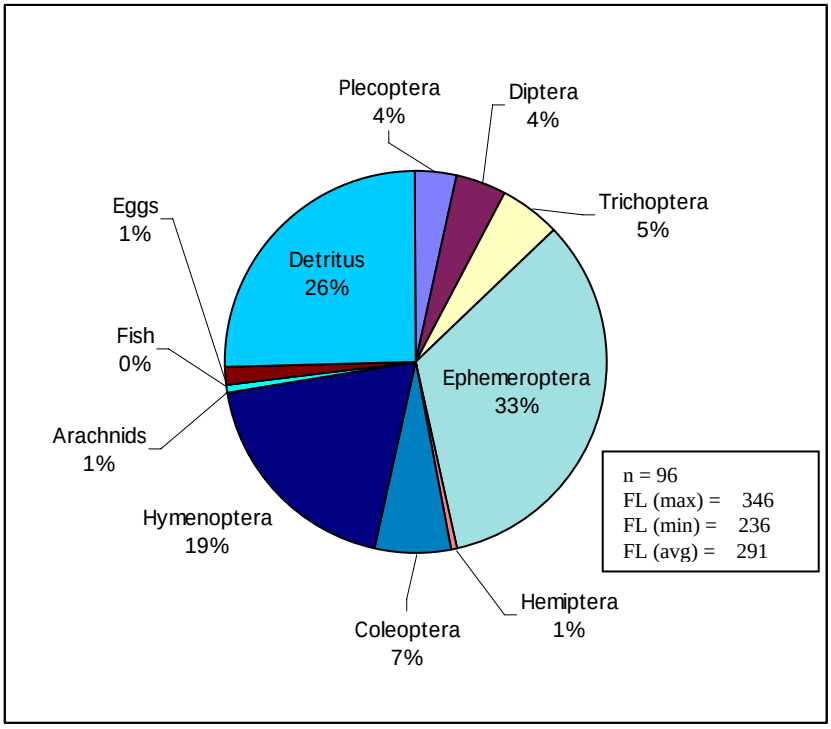


Figure 3.6-1. 2008 stomach contents of rainbow trout netted near Eagle Cliffs – Swift Reservoir.

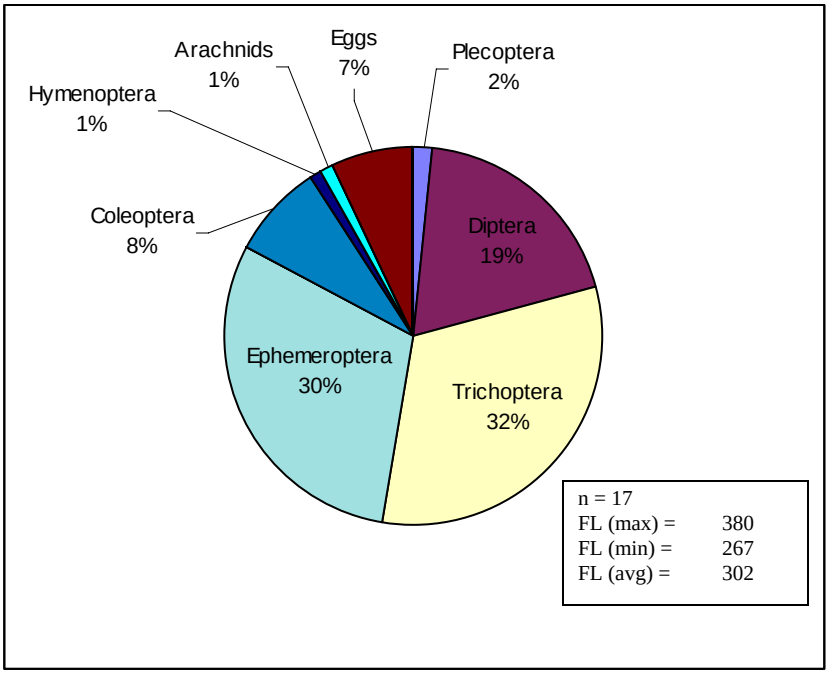


Figure 3.6-2. 2008 stomach contents of mountain whitefish netted near Eagle Cliffs – Swift Reservoir.

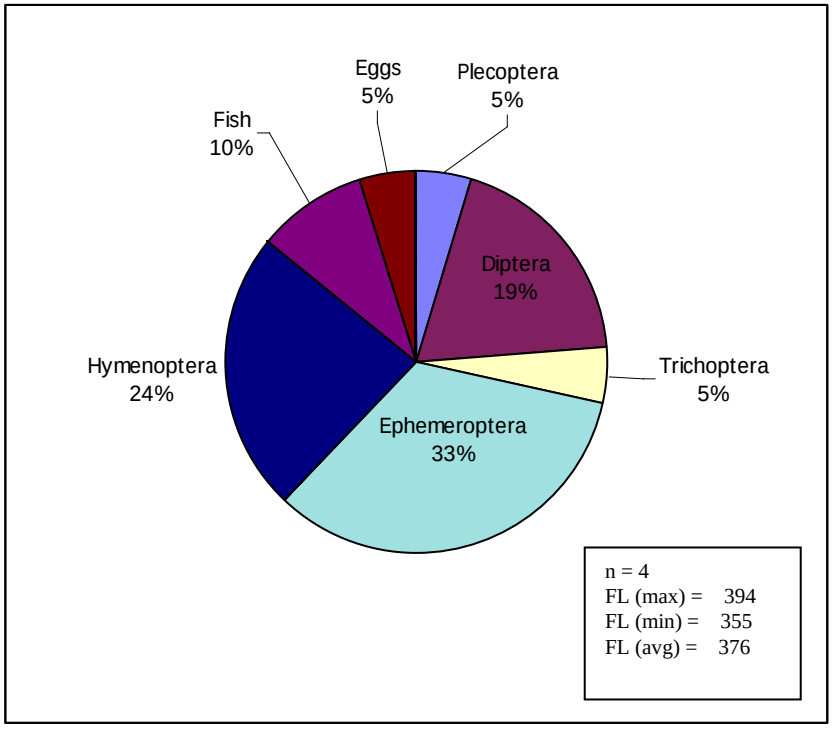


Figure 3.6-3. 2008 stomach contents of cutthroat netted near Eagle Cliffs – Swift Reservoir and Yale Tailrace.

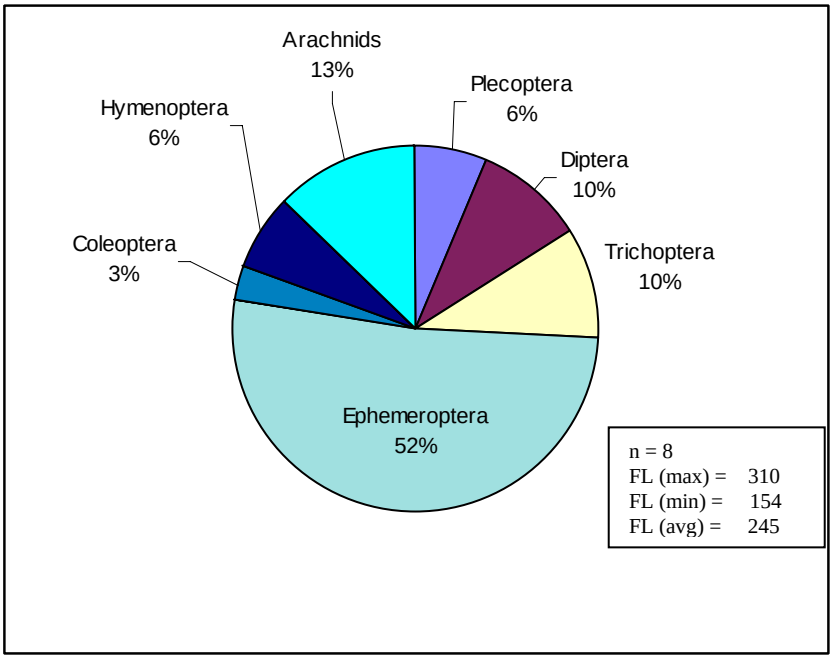


Figure 3.6-4. 2008 stomach contents of coho netted near Eagle Cliffs – Swift Reservoir.

3.7 SWIFT CREEK SURVEYS

In August of 2006, during the annual *Salvelinus confluentus* Curiosity Society workshop held that year on the Lewis River, Swift Creek was snorkeled by conference attendees from the stream mouth to the anadromous fish barrier. Four adult sized bull trout were witnessed for the first time within the confines of the stream. Based on these results, annual stream surveys have been performed within Swift Creek since 2006.

On July 22, 2008 two surveyors attempted to electrofish the margins of Swift Creek from the stream mouth to the anadromous fish barrier. The survey was suspended approximately 300m upstream from its start due to the high water velocity encountered and the unsafe situation that it presented. The stream temperature was measured at 7°C and during the survey the only salmonid captured was a 108mm FL rainbow trout. Along with the one juvenile rainbow, sculpin were also captured. That same day the mouth of Swift Creek and Swift Creek cove were also snorkeled. At the time of the snorkel survey the visibility was estimated to be app.10ft, one non-Floy® tagged bull trout (approx. 600mm FL) was observed at the mouth of the stream.

On August 8, 2008 Swift Creek cove was sampled via hook and line. One bull trout was captured. The captured bull trout was measured, weighed, inserted with a PIT tag, and sampled for genetic material (Table 3.7-1) before returning it to the stream. Water temperature near the surface of the cove was measured at 14°C.

On September 24, 2008 the entire accessible length of Swift Creek including Swift Creek cove was surveyed by snorkeling. Three surveyors, moving upstream, snorkeled the entire width of the stream to the anadromous fish barrier, a total distance of 1639 ft. No bull trout were observed in Swift Creek. One bull trout (approx. 500mm FL) was observed in Swift Creek cove. The one observed fish did not exhibit spawning morphology associated with a ripe adult (e.g. coloring up, large under kype in males, etc.)

Fish	Fork Length (mm)	Weight (grams)	PIT #
bull trout	487	1216	985121012624665

Table 3.7-1. Tag and biological information of captured Swift Creek bull trout, 2008.

3.8 BULL TROUT CONDITION FACTOR

A new endeavor undertaken in 2008 was the weighing of all captured bull trout, regardless of capture area. The goal of gathering this additional information is the intent to quantify the condition factor of bull trout in Merwin, Yale, and Swift Reservoirs. This standardized information can then be used as a comparison tool to gauge the condition of reservoir bull trout populations from year to year. This data may also offer insights into reservoir productivity, K-factors, and the potential influence of these on bull trout spawning migration frequency.

Condition factor is a simple weight-length relation that is generally thought to be one of several indices of healthy fish (Nielson and Johnson 1983). T.W. Fulton (1902) established the weight-length relation equation that was used to estimate K-factors in this study.

The Fulton-type equation used is as follows;

K= (W/L^3)*X

Where;

K = metric condition factor
W = weight in grams
L = length in millimeters
X = Arbitrary scaling constant (for our purposes 10^5 was used)

A hand-held scale was used to weigh fish during Lewis River netting activities. To weigh bull trout, a landing net was attached to the hand-held scale, the scale was allowed to tare to zero, and then a bull trout was placed in the landing net. The scale gave readings in tenths of a pound which were later converted to grams. The entire time bull trout were out of water was normally under 10 seconds. When feasible, bull trout were weighed on land or in calm coves, but a measure of inaccuracy was unavoidable when bull trout were weighed in a boat due to the pitch and roll of the boat in response to wave action. Surveyors felt this inaccuracy was acceptable if it alleviated any added undue stress to the captured bull trout due to over-handling or length of holding time.

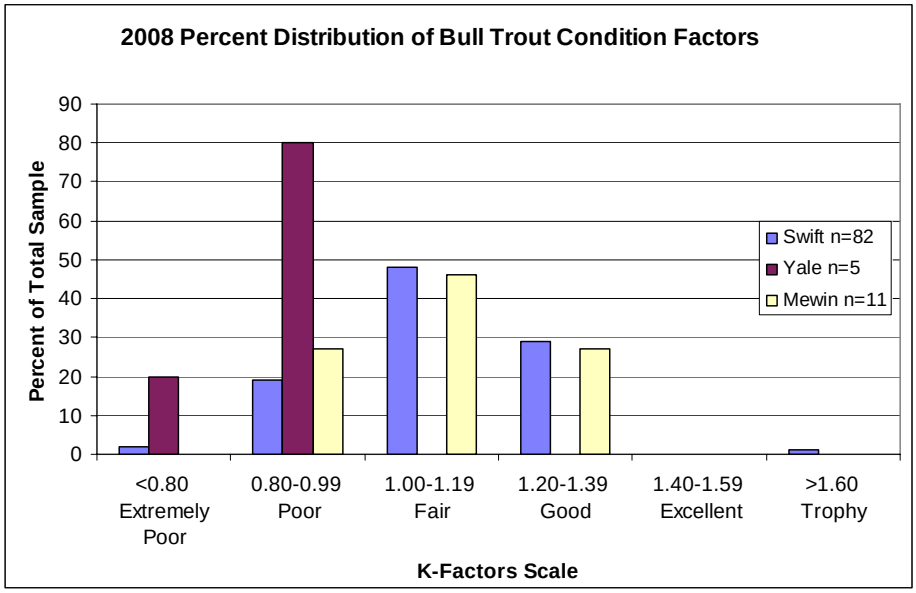
A total of ninety-eight bull trout were weighed from Merwin, Yale, and Swift reservoirs in 2008. Of those fish, eighty-two were from Swift Reservoir, eleven from Lake Merwin, and five from Yale Lake (not all captured bull trout were weighed in 2008 due to lack of available equipment). For salmonids, K factor values usually fall between 0.8 and 2.0. A K-factor scale was used to filter the data and to help analyze the values for comparison (Barnham and Baxter 1998). The scale used is as follows:

- Less than 0.80 = Extremely poor
- 1.00 = Poor
- 1.20 = Fair
- 1.40 = Good
- 1.60 = Excellent

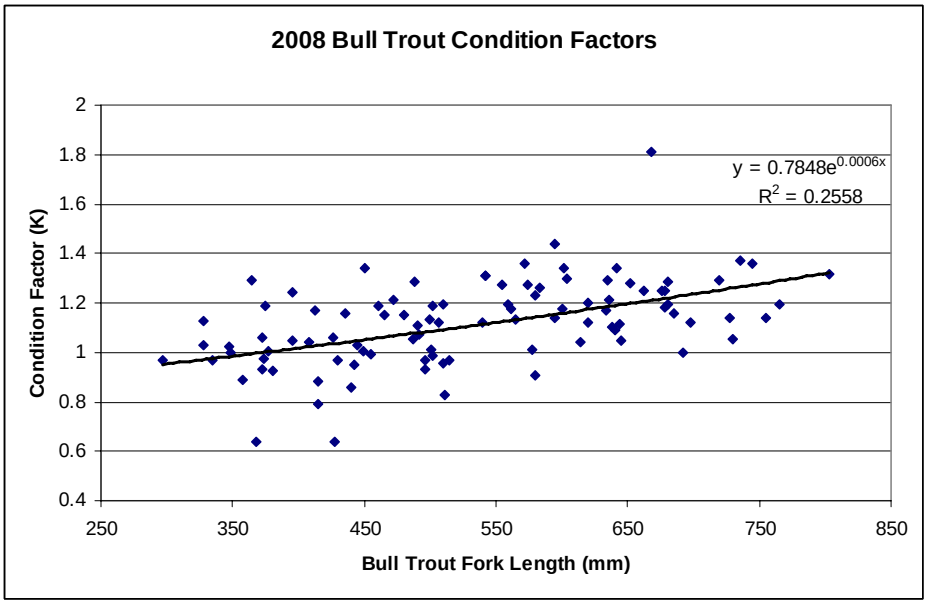
Graph 3.8-1 represents the percent distribution of weighed bull trout occurrences in the above mentioned K-factor scale. Bars in the graph are divided to represent bull trout from each reservoir. Graph 3.8-2 represents condition factors and their correlation to the corresponding fork length for each measured fish. Once again data sets are broken out by reservoir of capture. Data sets from both Merwin and Yale were extremely limited due to the low number

of fish handled in these two reservoirs (11 in Merwin, 5 in Yale), especially when compared to Swift Reservoir.

Median condition factor values were 1.15 for all fish sampled in Lake Merwin, 1.03 for fish sampled in Yale Lake, and 1.13 for fish sampled in Swift Reservoir. When comparing numeric fish condition factors, care needs to be taken to only compare fish of like fork lengths (Nielsen and Johnson 1983). Due to the small, recently established data set this was not followed in 2008. As additional information is gathered, sampled fish will be broken into size-class categories for more accurate comparisons. Although these low sampling numbers make it difficult to compare the data between reservoirs in 2008, this data will be useful for comparison to data gathered in the future.



Graph 3.8-1. Distribution of all weighed bull trout in 2008 over established condition factor scale.



Graph 3.8-2. Individual bull trout condition factors in relation to corresponding fork lengths for entire sample from all three reservoirs combined in 2008. Each point represents an individual fish.

4.0 CONCLUSION

As directed in Article 402 of the Federal Energy Regulatory Commission issued operating licenses for Merwin, Yale, Swift No.1, and Swift No.2 hydroelectric projects (issued June 26, 2008) and pursuant to Section 9.6 of the Lewis River Settlement Agreement, the Utilities are to monitor bull trout populations in Swift Reservoir and Yale Lake annually as well as annually capture and transport bull trout from the Yale and Swift No.2 tailrace areas. The Utilities collected this data contained in this report to accomplish these monitoring objectives.

The 2008 monitoring season experienced a later start than normal. Low elevation snow pack persisted in the basin well into June and the anticipated spring run-off that on normal years occurs in April-May, did not happen until June-July. Each year in anticipation of high winter and spring flows, the Utility draws down project reservoirs for flood control. Swift Reservoir is the main project used for flood control on the Lewis River and in 2008 the reservoir was drawn down a total of 85 ft. Couple the persistent low elevation snow with an unusually cold winter and spring where most precipitation fell as snow and subsequently the reservoir remained drawn down well into May. This large, protracted drawdown precluded any use of the reservoir until spring fill as the one available boat launch on Swift reservoir is not usable when the reservoir is down more than 22 ft.

Because of the persistent low reservoir elevations on Swift, Eagle Cliffs netting activities were delayed by one week. A minimum of ten netting days was still accomplished pursuant to the 2008 Bull Trout Monitoring Plan but netting activities persisted to the end of July whereas in prior years it terminates at the end of June or beginning of July. This later start caused all activities associated with the Swift Reservoir mark/recapture study to be delayed by one week.

For the fourth consecutive year we observed a decline in the estimate of bull trout that stage at Eagle Cliffs and then migrate up the North Fork Lewis River. The 2008 decline from the 2007 estimate was not as precipitous as declines observed in prior years, but was still down 25 percent from the previous estimate (380 in 2008 vs. 505 in 2007). A more interesting fact in comparing 2008 to 2007 was the amount of bull trout encountered during Eagle Cliffs netting activities, the number captured in 2008 was only 44 percent (88 in 2008 vs. 196 in 2007) of the number encountered during netting activities in 2007. Eagle Cliffs bull trout capture methodologies and the amount of effort expended remained similar since 2000. The assumption that an estimate of bull trout that stage at Eagle Cliffs in the spring and subsequently migrate up the North Fork Lewis River provides a reasonable estimator of reservoir population size, is one that will be addressed in the 2009 Annual Bull Trout Monitoring Plan for the North Fork Lewis River.

Bull trout collection in the Yale Tailrace in 2008 was a historically high capture number for the second year in a row with the bulk of the captured fish being of a smaller size than observed in previous years. New methodologies to capture these fish continue to be investigated, though at this time tangle nets remain the most effective and efficient. With the construction of the Yale Entrainment Reduction Net, pursuant to section 4.9.3 of the Lewis River Settlement Agreement in 2009, capture numbers of bull trout in the Yale tailrace are anticipated to decline.

Collection and tagging activities within the Swift Bypass Reach continued in 2008 though capture numbers declined significantly from the previous year. The substrate morphology of the area of capture within the bypass reach changed in 2008 from 2007. During 2007 netting activities the stream bottom in the "I.P. Hole" was smooth and filled with gravel allowing ease of bringing in deployed nets. In 2008, a portion of the gravel was scoured out during high spring flows which in turn exposed an irregular shaped bedrock stream bottom in the capture area. This irregular-shaped stream bottom proved cumbersome when trying to net bull trout as it provided multiple areas of escape that were not encountered in 2007. Disposition of these captured bull trout will continue to be evaluated annually by FWS, currently fish are captured, tagged and returned to the point of capture.

Surveys methodologies for Cougar Creek continue to be standardized; especially with bull trout redd surveys. Bull trout redds observed in the creek were the highest on record and the number of bull trout observed during the peak snorkel/foot count was the highest since 1979 when the number of bull trout observed also was 40. Multiple redd surveys encountered bull trout physically on redds and at times in the process of excavating. Information concerning a bull trout-per-redd expansion factor is still needed. Methods for obtaining this information will continue to be evaluated in the future.

Once again bull trout were observed in Swift Creek and Swift Creek cove for an extended period of time during the summer and fall, though not on the magnitude observed in 2007. Surveys of Swift Creek will continue in 2009 to document the presence or absence of bull trout. 2008 surveys of tributaries Spencer Creek and Cussed Hollow Creek to the upper North Fork Lewis River were unsuccessful in locating any bull trout.

Due to the lack of any bull trout fry found in stomach samples from hatchery rainbow trout in Swift Reservoir this year, the need to evaluate the effects of hatchery supplementation on bull trout does not appear to be necessary at this time. However, given the continuation of larger size rainbow trout plants in Swift Reservoir, we propose to continue our efforts in evaluating the prey base of these larger hatchery rainbow trout in order to document any bull trout/rainbow trout interactions.

Weights of all handled bull trout were taken in 2008. Individual weights were then compared to corresponding fork lengths and fish condition factors were assigned. It is anticipated that this information may offer insight to reservoir productivity as it relates to bull trout, and the overall health of individual bull trout. This can then be related to how fish condition may affect their behavior especially in terms of gamete production from one year to the next. Collection of condition factor information will continue in 2009.

5.0 LITERATURE CITED

Barnham, C., and A. Baxter. 1998. Fisheries Notes, Condition Factor, K, for Salmonid Fish. State of Victoria, Department of Primary Industries 2003. 3 pages.

Baxter, J.S., and W.T. Westover. 2000. An overview of the Wigwam River bull trout program, 1995-1999. Final report to Habitat Conservation Trust Fund. Fisheries Project Report KO 58. 23 pages.

Budy, P., R. Al-Chokhachy, and G.P. Thiede. 2003. Bull trout population assessment and life-history characteristics in association with habitat quality and land use in the Walla Walla River Basin: a template for recovery planning. 2002 Annual Progress Report to US Fish and Wildlife Service, Vancouver, Washington. 55 pages.

Clearwater Biostudies, Inc. 2002. Bull trout surveys and stream temperature monitoring conducted within selected watersheds on the Gifford Pinchot National Forest. Draft. USDA Forest Service Contract No. 43-05K3-1-088.

Doyle, J. and Lesko, E. 2007. Threatened and Endangered Species. Annual Bull Trout Monitoring Report. PacifiCorp Energy.

Dunham, J., B. Rieman, and K. Davis. 2001. Sources and magnitude of sampling error in redd counts for bull trout *Salvelinus confluentus.* North American Journal of Fisheries Management 21: 343-352.

Fraley, J.J. and B.B. Shepard. 1989. Life history, ecology, and population status of migratory bull trout (Salvelinus confluentus) in the Flathead Lake and river system, Montana. Northwest Science 63: 133-143.

Fulton, T.W. 1902. The rate of growth of fishes. 20th Annual Report of the Fishery Board of Scotland 1902 (3):326-446.

Muhfeld. C.C., M. Taper, D. Staples, and B. Shepard. 2006. Observer Error Structure in Bull Trout Redd Counts in Montana Streams: Implications for Inference on True Redd Numbers. Transactions of the American Fisheries Society 135:643-654.

Nerass, L., and P. Spruell. 2004. Genetic Analysis of Lewis River Bull Trout. Final report WTSGL04-101 to PacifiCorp. February 2004.

Nielsen, L.A., and D.L. Johnson. 1983. Fisheries Techniques. 1983 by the American Fisheries Society. Pgs. 294-295.

PacifiCorp and Cowlitz County P.U.D. 2004 Technical Study Status Report. Assessment of Potential Anadromous Fish Habitat Upstream of Merwin Dam. 1999-2000.

Powers, D. Patrick, and John F. Orsborn. 1985. Analysis of Barriers to Upstream Fish Migration; an Investigation of the Physical and Biological Conditions Affecting Fish Passage Success at Culverts and Waterfalls. Bonneville Power Administration Project No. 82-14.

Ratliff, D.E., S.L. Thiesfield, W.G. Weber, A.M. Stuart, M.D. Riehle, and D.V. Buchanan 1996. Distribution, life history, abundance, harvest, habitat and limiting factors of bull trout in the Metolius River and Lake Billy Chinook, Oregon, 1983-1994. Information Report, Oregon Department of Fish and Wildlife, Portland.

Sankovich. P.M., S.J. Starcevich, A.R. Hemmingsen, and S.L. Gunckel. 2003. Migratory Patterns, Structure, Abundance, and status of bull trout populations from subbasins in the Columbia Plateau and Blue Mountain provinces. Bonneville Power Administration. Project No. 199405400.

Seber, G.A.F. 1982. The estimation of animal abundance, 2nd Edition. Charles Griffin and Company, London, England.

Taylor, G., and A. Reasoner. 2000. Bull trout Salvelinus confluentus population and habitat surveys in the McKenzie and Middle Fork Willamette basins. 1999. Bonneville Power Administration. Project No. 1995-05300.

Weeber, Matt. 2006. Affects of kokanee redd superimposition on bull trout egg-to-fry survival: Summary of initial findings. ODFW Native Fish Investigations Project.

APPENDIX A

SWIFT RESERVOIR BULL TROUT CAPTURE DATABASE FOR 2008

Record #	Capture #	DATE	LENGTH (mm)	FLOY COLOR	FLOY #	PIT #	RECAP COLOR	Weight (grams)	NOTES
1245	R	5/22/2008	692	Yellow	1		Blue 73	3311.22	
1246	955	5/22/2008	514	Yellow	2			1315.42	
1247	956	5/29/2008	488	Yellow	3	3D91H1C2C458AF4		1496.85	
1248	R	6/4/2008	580	Yellow	4		red/orange 87	1769.01	
1249	R	6/11/2008	435	Red/Chart.	1		Blue 111	952.544	
1250	957	6/11/2008	510	Yellow	6	3D91H1C2C488F33		1270.06	
1251	958	6/11/2008	565	Yellow	7	3D91H1C2C4878A0		2041.17	
1252	959	6/11/2008	540	Yellow	8	3D91H1C2C464677		1769.01	
1253	R	6/11/2008	765	Yellow	9		B - 039	5352.39	
1254	R	6/11/2008	735	Yellow	10		B - 089	5443.11	
1255	960	6/18/2008	430	Red/Chart.	2	3D91H1C2460287		771.107	
1256	R	6/18/2008	640	Yellow	11		Blue 101	2857.63	
1257	R	6/18/2008	645	Yellow	12		Chart. 119 & Blue 003	2812.27	
1258	961	6/18/2008	510	Yellow	13	3D91H1C2C459FF6		1587.57	
1259	R	6/18/2008	745	Yellow	14		Blue 007	5624.55	
1260	962	6/18/2008	600	Yellow	15	3D91H1C2C46411D		2540.12	
1261	963	6/18/2008	755	Yellow	16	3D91H1C2C460287		4898.8	
1262	R	6/25/2008		Yellow			Yellow 013		
1263	964	6/25/2008	328	too small		3D91H1C2C433875		362.874	
1264	965	6/25/2008	803	Yellow	17	3D91H1BF23DB737		6803.89	
1265	966	6/25/2008	583	Yellow	18	3D91H1C2C469459		2494.76	
1266	967	6/25/2008	559	Yellow	19	3D91H1C2C48653D		2086.52	
1267	968	6/25/2008	328	too small		3D91H1C2C489843		396.893	
1268	969	6/25/2008	595	Yellow	20	39D1H1BF23DC302		3034.53	
1269	R	7/2/2008		Yellow			Yellow 001		
1270	R	7/2/2008		Yellow			Yellow 003		
1271	970	7/2/2008	508	Yellow	21	3D91H257C665B4C			
1272	R	7/2/2008		too small			Previous weeks small		
1273	R	7/2/2008		too small			Previous weeks small		
1274	R	7/2/2008	572	Yellow	22		Red orange 125	2540.12	
1275	971	7/2/2008	555	Yellow	23	3D91H1BF23C6C5C		2177.24	
1276	R	7/9/2008	681	Yellow	24		Blue 57 in 2004	4055.12	
1277	R	7/9/2008	492	Yellow	25		Blue 145	1274.59	
1278	R	7/9/2008	662	Yellow	26		Red orange 156	3628.74	
1279	972	7/9/2008	602	Yellow	27	3D91H1C2C48AE0E		2921.13	
1280	973	7/9/2008	681	Yellow	28	3D91H1C2C434183		3764.82	
1281	974	7/9/2008	511	Yellow	29	3D91H1C2C46989D		1106.77	
1282	975	7/9/2008	496	Yellow	30	3D91H1C2C48AC93		1133.98	
1283	976	7/9/2008	480	Yellow	31	3D91H1C2C456A4A		1274.59	
1284	977	7/9/2008	455	Yellow	32	3D91H1C2C43419D		934.4	
1285	978	7/9/2008	442	Red/Chart.	3	3D91H1C2C48B898		821.002	
1286	R	7/9/2008	652	Yellow	33		Blue 78	3542.56	
1287	R	7/9/2008	720	Yellow	34		Blue 80	4821.69	
1288	R	7/9/2008	728	Yellow	35&36		Blue 59	4395.31	

Record #	Capture #	DATE	LENGTH (mm)	FLOY COLOR	FLOY #	PIT #	RECAP COLOR	Weight (grams)	NOTES
1289	979	7/9/2008	636	Yellow	37	3D91H1C2C4691DZ		3120.72	
1290	980	7/9/2008	595	Yellow	38	3D91H1C2C513ACC		2404.04	
1291	R	7/9/2008	642	Yellow	39		Blue 119	3542.56	
1292	981	7/9/2008	377	Red/Chart.	4	3D91H1C2C460806		539.775	
1293	982	7/16/2008	372	Red/Chart.	5	3D91H1C2C4687E9		544.311	
1294	983	7/16/2008	358	too small		3D91H1C2C456739		408.233	
1295	984	7/16/2008	335	too small		3D91H1C2C489D4C		362.874	
1296	985	7/16/2008	368	Red/Chart.	6	3D91H1C2C456891		317.515	
1297	986	7/16/2008	449	Red/Chart.	7	3D91H1C2C46DFCC		907.185	
1298	987	7/16/2008	428	Red/Chart.	8	3D91H1C2C4893AE		498.952	
1299	988	7/16/2008	578	Yellow	40	3D91H1C2C3EBCE7		1950.45	
1300	R	7/16/2008	678	Yellow	41		Blue 135	3900.89	
1301	R	7/16/2008	506	Yellow	42		Blue 51	1451.5	
1302	989	7/16/2008	542	Yellow	43	3D91H1C2C4611AA		2086.52	
1303	R	7/16/2008	496	Yellow	44		Blue 66	1179.34	
1304	R	7/16/2008	678	Yellow	See 57		Blue 32 and Chart. 122	3674.1	
1305	R	7/16/2008	635	Yellow	46		Blue 42	3311.22	
1306	990	7/16/2008	620	Yellow	47			2857.63	
1307	991	7/16/2008	562	Yellow	48			2086.52	
1308	992	7/16/2008	676	Yellow	49			3855.54	
1309	993	7/16/2008	668	Yellow	50			5397.75	
1310	R	7/16/2008	542	Yellow	51			2086.52	RUSH SCREW TRAP 5/27/04
1311	R	7/23/2008	574	Yellow	52		red orange 1341	2408.58	SWIFT CK PRE-OPEN @464
1312	R	7/23/2008	502	Yellow	53		Blue 69	1501.39	
1313	R	7/23/2008	490	Yellow	54		red orange 137	1306.35	
1314	994	7/23/2008	347	too small				426.377	
1315	R	7/23/2008	604	Yellow	55		Blue 71	2857.63	
1316	R	7/23/2008	730	Yellow	56		Blue 56	4109.55	
1317	R	7/23/2008	685	Yellow	57		Lost yellow 45	3714.92	WAS THIS YEAR Y 45
1318	R	7/23/2008	634	Yellow	58		Blue 33	2975.57	
1319	995	7/23/2008	620	Yellow	59	3D91H1C2C45661F		2667.12	
1320	996	7/23/2008	381	Red/Chart.	9	3D91H1C2C4694D6		512.559	
1321	R	7/23/2008		Yellow			Yellow 007		
1322	997	7/23/2008	500	Yellow	60	3D91H1C2C489498		1419.74	
1323	R	7/30/2008	644	Yellow	61		Blue 140	2975.57	
1324	R	7/30/2008	698	Yellow	62		Blue 132	3801.1	
1325	998	7/30/2008	461	Yellow	63	3D91H1C2C455DE4		1161.2	
1326	R	7/30/2008	580	Yellow	64		red orange 083	2404.04	
1327	999	7/30/2008	502	Yellow	65	3D91H1C2C3FD180		1247.38	
1328	1000	7/30/2008	472	Yellow	66	3D91H1C2C48914E		1274.59	
1329	1001	7/30/2008	297	too small		3D91H1C2C487A3E		254.012	
1330	1002	7/30/2008	408	Red/Chart.	10	3D91HC2C468A0A		707.604	
1331	R	7/30/2008		Yellow			yellow 004		
1332	1003	7/30/2008	426	Red/Chart.	11	3D91H1C2C46DE52		821.002	
1333	1003	7/30/2008	374	Mort				508.023	Mort, hook in gullet

APPENDIX B

YALE TAILRACE BULL TROUT CAPTURE DATABASE

	LIVE FISH CAUGHT	LIVE FISH TO YALE	INITIAL CAPTURE DATE	LOCATION	TAG #	TAG TYPE	LENGTH (mm)	COMMENTS
1995	1	1	11-Sep-95	Yale TR	00051	Yellow Floy	590	
	2	M	11-Sep-95	Yale TR	00052	Yellow Floy	640	still in Merwin reservoir
	3	M	11-Sep-95	Yale TR	00053	Yellow Floy	700	still in Merwin reservoir
	4	M	11-Sep-95	Yale TR	00054	Yellow Floy	525	still in Merwin reservoir
	5	M	11-Sep-95	Yale TR	00055	Yellow Floy	690	still in Merwin reservoir
	6	M	11-Sep-95	Yale TR	00056	Yellow Floy	820	still in Merwin reservoir
	7	M	11-Sep-95	Yale TR	00057	Yellow Floy	565	still in Merwin reservoir
	8	2	11-Sep-95	Yale TR	00058	Yellow Floy	625	
	R	R	18-Sep-95	Yale TR	00051	Yellow Floy	Recapture	Released in Yale
	R	R	18-Sep-95	Yale TR	00058	Yellow Floy	Recapture	Released in Yale
	9	3	18-Sep-95	Yale TR	00101	Yellow Floy	620	
	10	4	18-Sep-95	Yale TR	00102	Yellow Floy	450	
	11	5	18-Sep-95	Yale TR	00103	Yellow Floy	770	
	12	6	18-Sep-95	Yale TR	00104	Yellow Floy	550	
	13	7	26-Sep-95	Yale TR	00059	Yellow Floy	680	
	14	8	26-Sep-95	Yale TR	00060	Yellow Floy	750	
	15	9	26-Sep-95	Yale TR	00061	Yellow Floy	440	
1996	16	10	10-Sep-96	Yale TR	00076	Yellow Floy	535	
	17	11	10-Sep-96	Yale TR	00077	Yellow Floy	545	
	18	12	10-Sep-96	Yale TR	00078	Yellow Floy	575	
	19	13	10-Sep-96	Yale TR	00079	Yellow Floy	615	
	20	14	10-Sep-96	Yale TR	00080	Yellow Floy	590	
	21	15	10-Sep-96	Yale TR	00081	Yellow Floy	490	
	R	R	10-Sep-96	Yale TR	00051	Yellow Floy	710*	*Recapture from 1995 sampling
	22	16	10-Sep-96	Yale TR	00083	Yellow Floy	660	
	23	17	10-Sep-96	Yale TR	00084	Yellow Floy	460	
	24	18	1-Oct-96	Yale TR	00085	Yellow Floy	453	
	25	19	1-Oct-96	Yale TR	00086	Yellow Floy	452	
	26	20	1-Oct-96	Yale TR	00088	Yellow Floy	384	Harvested by angler in Yale
	27	21	1-Oct-96	Yale TR	00089	Yellow Floy	422	
	28	22	1-Oct-96	Yale TR	00090	Yellow Floy	530	
	29	M	31-Oct-96	Yale TR	00091	Yellow Floy	510	Released in Merwin
	30	M	31-Oct-96	Canyon Cr. Mouth	00975	Orange Floy	330	Released in Merwin
1997	31	23	10-Sep-97	Yale TR	00506	Pink Floy	444	
	32	24	10-Sep-97	Yale TR	00507	Pink Floy	489	
	33	25	10-Sep-97	Yale TR	00508	Pink Floy	533	

	LIVE FISH CAUGHT	LIVE FISH TO YALE	INITIAL CAPTURE DATE	LOCATION	TAG #	TAG TYPE	LENGTH (mm)	COMMENTS
	34	26	10-Sep-97	Yale TR	00509	Pink Floy	381	
	35	27	10-Sep-97	Yale TR	00510	Pink Floy	400	
	36	28	17-Sep-97	Yale TR	00511	Pink Floy	546	Possible tag loss from past marking
	37	29	17-Sep-97	Yale TR	00512	Pink Floy	572	
	38	30	24-Sep-97	Yale TR	00513	Pink Floy	582	
	39	31	24-Sep-97	Yale TR	00514	Pink Floy	635	Recap RD, mouth chewed up, died at Cougar weir
	40	32	24-Sep-97	Yale TR	00515	Pink Floy	520	
1998	41	33	10-Sep-98	Yale TR	00302	YELLOW	610	Released in Yale, no tag scars
	42	34	10-Sep-98	Yale TR	00303	YELLOW	692	Released in Yale, no tag scars
	43	35	10-Sep-98	Yale TR	00304	YELLOW	673	Released in Yale, no tag scars
	44	36	10-Sep-98	Yale TR	00305	YELLOW	736	Released in Yale, no tag scars
	45	37	10-Sep-98	Yale TR	00306	YELLOW	724	Released in Yale, no tag scars
	46	38	16-Sep-98	Yale TR	00307	YELLOW	737	Released in Yale, no tag scars
1999	47	M	13-Aug-99	Yale TR	00105	YELLOW	695	Male, released in Merwin
	48	M	13-Aug-99	Yale TR	00107	YELLOW	362	Female, released in Merwin
	49	M	13-Aug-99	Yale TR	00108	YELLOW	686	Revived, female, released in Merwin
	50	M	13-Aug-99	Yale TR	00109	YELLOW	534	Female, released in Merwin
	51	M	13-Aug-99	Yale TR	00110	YELLOW	483	Male, released in Merwin
	52	M	13-Aug-99	Yale TR	00111	YELLOW	715	Male, released in Merwin
2000	53	39	6-Sep-00	Yale TR	00777	PINK	749	Male
	54	40	6-Sep-00	Yale TR	00778	PINK	559	Female
	55	41	6-Sep-00	Yale TR	00779	PINK	457	Female
	56	42	6-Sep-00	Yale TR	00780	PINK	425	Male
	57	43	6-Sep-00	Yale TR	00781	PINK	572	
	58	44	13-Sep-00	Yale TR	00782	PINK	495	Back Injury, skinny
	59	45	27-Sep-00	Yale TR	00783	PINK	711	
2001								surveys 9/5; 9/12; 9/19 yielded no bull trout
2002	60	46	12-Sep-02	Yale TR	05425	Yellow Floy	381	ADFG Floy Tag
	61	47	12-Sep-02	Yale TR	05426	Yellow Floy	468	ADFG Floy Tag, right pec. fin missing
	62	M	12-Sep-02	Yale TR	05427	Yellow Floy	660	ADFG Floy Tag
	63	48	26-Sep-02	Yale TR	05431	Yellow Floy	590	Released in Merwin, Motor failure, spillway hole
	64	49	24-Sep-02	Yale TR	05429	Yellow Floy	335	1 HR fished, hatchery truck trouble
	65	50	24-Sep-02	Yale TR	05430	Yellow Floy	465	2 HR fished, hatchery truck trouble
2003	66	51	9-Jul-03	Yale TR	00001	BLUE	750	
	67	52	9-Jul-03	Yale TR	00002	BLUE	636	
	68	53	9-Jul-03	Yale TR	00003	BLUE	453	

	LIVE FISH CAUGHT	LIVE FISH TO YALE	INITIAL CAPTURE DATE	LOCATION	TAG #	TAG TYPE	LENGTH (mm)	COMMENTS
	69	54	9-Jul-03	Yale TR	00004	BLUE	400	Too small for sonic tag
	70	MORT	16-Jul-03	Yale TR			586	HATCHERY MORTALITY
	71	MORT	16-Jul-03	Yale TR			516	HATCHERY MORTALITY
	72	MORT	16-Jul-03	Yale TR			408	HATCHERY MORTALITY
	73	MORT	16-Jul-03	Yale TR			347	HATCHERY MORTALITY
	74	MORT	16-Jul-03	Yale TR			572	HATCHERY MORTALITY
	75	MORT	16-Jul-03	Yale TR			546	HATCHERY MORTALITY
	76	MORT	16-Jul-03	Yale TR				HATCHERY MORTALITY
	77	MORT	16-Jul-03	Yale TR				HATCHERY MORTALITY
	78	MORT	16-Jul-03	Yale TR				HATCHERY MORTALITY
	79	M	23-Jul-03	Yale TR	1201	GREEN		Released at Speelyai Bay
	80	55	30-Jul-03	Yale TR	16	BLUE	800	Released at Cougar Park
	81	56	30-Jul-03	Yale TR	12	BLUE	325	
	82	MORT	30-Jul-03	Yale TR			403	
	83	57	6-Aug-03	Yale TR	11	BLUE	375	
	84	58	6-Aug-03	Yale TR	10	BLUE	371	
2004	85	59	10-Jun-04	Yale TR	289	WHITE	650	Released at Saddle Dam
	86	60	10-Jun-04	Yale TR	290	WHITE	603	Released at Saddle Dam
	87	M	6/24/2004	Yale TR	662	WHITE	291	Female, caudal erosion, Speelyai Bay release
	R	R	6/24/2004	Yale TR	698			Recapture of 444, looked good, wounds all healed, no floy
	88	M	7/8/2004	Yale TR	292	WHITE	583	Released in Speelyai Bay
	89	M	7/22/2004	Yale TR	293	WHITE	585	Released in Speelyai Bay
	90	M	7//22/04	Yale TR	294	WHITE	538	Released in Speelyai Bay
	91	61	8/5/2004	Yale TR	295	WHITE	595	Not Sonic Tagged (tag was not working)
2005	91	61	6/24/2005	Yale TR				No fish caught, experimental seine used
	92	62	7/12/2005	Yale TR	827	ORANGE	590	**Recap of Sonic Tag #457, growth of 52 mm in 1 year**
	93	63	7/12/2005	Yale TR	828	ORANGE	690	
	94	64	7/21/2005	Yale TR	829	ORANGE	565	Using Gill Nets
	95	65	7/21/2005	Yale TR	830	ORANGE	475	White Floy 294, Taken to Yale
	R	R	7/21/2005	Yale TR				Recapture of Sonic Tag 457
	96	66	7/28/2005	Yale TR	831	ORANGE	763	Large fish
	96	66	8/11/2005	Yale TR				NO BULL TROUT CAUGHT (4 nets fishing)
	96	66	9/1/2005	Yale TR				No bull trout, 1 adult chinook salmon (done for year)
2006	97	67	6/1/2006	Yale TR	1501	GREEN	561	Left Eye old injury, probably blind in left eye (picture available in Picasa

	LIVE FISH CAUGHT	LIVE FISH TO YALE	INITIAL CAPTURE DATE	LOCATION	TAG #	TAG TYPE	LENGTH (mm)	COMMENTS
	97	67	6/8/2006	Yale TR				No Bull Trout (Experimental Purse Seine Used) Deployment problems
	97	67	6/15/2006	Yale TR				No Bull Trout Captured
	97	67	6/22/2006	Yale TR				No Bull Trout Captured
	98	68	7/6/2006	Yale TR	00001	GREEN	620	Good healthy Fish
	99	69	7/6/2006	Yale TR	00002	GREEN	450	Good healthy Fish
	100	70	7/6/2006	Yale TR	00003	GREEN	600	Good healthy Fish
	100	70	7/13/2006	Yale TR				No Bull Trout Captured
	101	71	7/20/2006	Yale TR	00004	GREEN	368	CT X RB cross (285, 280, 280, 285) lavaged, 4 diptera, 2 ephemeroptera,1 isopoda
	101	71	8/3/2006	Yale TR				RB 210, lavage = algae; CT 285, lavage = 68mm stickleback; no bull trout
	101	71	8/16/2006	Yale TR				CT 300 mm various fish bones
	101	71	8/31/2006	Yale TR				SCCS
2007	102	72	6/7/2007	Yale TR	00001	Chartreuse	642	Good healthy Fish
	103	73	6/7/2007	Yale TR	00002	Chartreuse	430	Good healthy Fish
	104	74	6/7/2007	Yale TR	00003	Chartreuse	474	Wrapped in net with mouth closed, initially thought mort but fish was revived, gilling and swimming freely when released.
	105	75	6/7/2007	Yale TR	00004	Chartreuse	610	Good healthy Fish
	106	76	6/14/2007	Yale TR	00005	Chartreuse	394	Good healthy Fish
	107	77	6/14/2007	Yale TR	00006	Chartreuse	420	Good healthy Fish
	108	78	6/14/2007	Yale TR	00007	Chartreuse	395	Good healthy Fish
	109	79	6/21/2007	Yale TR	00008	Chartreuse	521	Healthy fish, recap of fish from previous year green floy #00002, fish grew 71mm in one year
	109	79	6/28/2007	Yale TR				No Bull Trout Captured
	110	80	7/19/2007	Yale TR	00010	Chartreuse	542	Old puncture wound by LP, wound to LV. Released at Saddle Dam, no hatchery truck.
	111	81	7/26/2007	Yale TR	00009	Chartreuse	527	Good healthy Fish
	112	82	7/26/2007	Yale TR	00011	Chartreuse	363	Good healthy Fish
	113	83	7/26/2007	Yale TR	00012	Chartreuse	362	Good healthy Fish
	114	84	7/26/2007	Yale TR	00013	Chartreuse	523	Good healthy Fish
	114	84	8/2/2007	Yale TR				No Bull Trout Captured
	114	84	8/23/2007	Yale TR				No Bull Trout Captured, end surveys by 8/15 next year.

2008

LIVE FISH CAUGHT	LIVE FISH TO YALE	INITIAL CAPTURE DATE	LOCATION	TAG #	TAG TYPE	LENGTH (mm)	PIT#	Weight (lbs.)	Comments
115	85	6/19/2008	Yale TR	0001	1/2 Yellow 1/2 Green	365	985121012736452	1lb. 6oz.	Water temp. 10°C. Caught via hook & line, new bite wound to ventral area.
116	86	6/19/2008	Yale TR	0002	1/2 Yellow 1/2 Green	413	985121012653443	1lb. 13oz.	Good healthy Fish
117	87	6/19/2008	Yale TR	0003	1/2 Yellow 1/2 Green	395	985121012655977	1lb. 7oz.	Good healthy Fish
118	88	6/19/2008	Yale TR	0004	1/2 Yellow 1/2 Green	450	985121012609398	2lb. 11oz.	Good healthy Fish
119	89	6/26/2008	Yale TR	0005	1/2 Yellow 1/2 Green	395	985121012726802	1lb. 11oz.	Good healthy Fish, captured whitefish 312mm
120	90	7/3/2008	Yale TR	0006	1/2 Yellow 1/2 Green	440	985121012645857	1lb. 10oz.	LP gone/water temp 11.5°C
121	91	7/3/2008	Yale TR	0007	1/2 Yellow 1/2 Green	465	985121012722258	2lb. 9oz.	Good healthy fish
122	92	7/3/2008	Yale TR	0008	1/2 Yellow 1/2 Green	415	985121012610730	1lb. 6oz.	captured via hook&line, healthy
123	93	7/11/2008	Yale TR	0009	1/2 Yellow 1/2 Green	375	985121012610175	1lb. 6oz.	Good healthy fish
124	94	7/17/2008	Yale TR	0010	1/2 Yellow 1/2 Green	372	985121012645476	1lb. 1oz.	Good healthy fish. Water temp 12°C
125	95	7/24/2008	Yale TR	0011	1/2 Yellow 1/2 Green	430	985121012742843	n/a	Healthy fish - Water temp 13°C - No scale for weight
126	96	7/24/2008	Yale TR	0012	1/2 Yellow 1/2 Green	410	985121012609337	n/a	Healthy fish
127	97	7/24/2008	Yale TR	0013	1/2 Yellow 1/2 Green	398	985121012762089	n/a	Healthy fish
128	98	7/24/2008	Yale TR	too small	n/a	310	985121012747328	n/a	Healthy fish, too small for Floy tag
129	99	7/31/2008	Yale TR	too small	n/a	349	985121012653305	15 oz.	Healthy fish, water temp 12°C
129	99	8/6/2008	Yale TR						No bull trout captured many kokanee.

APPENDIX C

CONSTRUCTED CHANNEL MARK/RECAPTURE DATA
2008

Initial Mark

Fish	Fork length (mm)
CT	120
CT	135
CT	140
CT	141
CT	140
CT	132
CT	151
CT	97
CT	75
CT	68
CT	70
CT	150
CT	153
CT	182
CT	203
CT	175
CT	143
CT	157
CT	330
CT	125
CT	266
CT	142
CT	138
CT	146
WF	440
WF	255
WF	270
WF	263
WF	225
WF	240
WF	73
WF	230
WF	245
WF	306
WF	321
WF	330
WF	222
WF	276
WF	400
WF	285
WF	280
WF	322
WF	229
WF	336

Recapture

Fish	Fork Length (mm)	Clipped
CT	108	
CT	209	
CT	165	
CT	n/a	
CT	150	
CT	153	
CT	154	
CT	122	
CT	104	
CT	132	yes
CT	174	
CT	120	
CT	140	yes
CT	220	
CT	140	
CT	155	
CT	148	
CT	145	yes
CT	144	
CT	168	
CT	164	
CT	123	
CT	74	
WF	210	
WF	270	yes
WF	285	yes
WF	288	
WF	265	
WF	240	
WF	220	
RB	390	
RB	400	
RB	322	
RB	332	
BKT	257	
BKT	77	
BKT	221	

APPENDIX D

AGENCY COMMENTS

Email and attachment of comments sent in by Lou Ellyn Jones of the United States Fish and Wildlife Service:

Email:
Attached is an email I sent to PacifiCorp after reading the Annual Bull Trout Monitoring Report and attending the annual bull trout coordination meeting. The email refers to the declines in the Swift populations and suggests several ways for us to proceed. We are in the process of fine tuning a course of action as we approach the 2009 field season.

Although this email is not a formal comment on the monitoring report, our agency's comments about the report and the 2009 monitoring plan can be inferred. Thank you.

(See attached file: Follow up to the bull trout file.pdf)

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Attachment:
I thought our field coordination and annual bull trout meeting was very good and I appreciated
everyone's attendance. I wanted to clarify and document what I think we agreed to as far as next steps in transporting bull trout upstream past Swift 1 dam. Also, I wanted to add another proposal to our list of actions to evaluate.
I think we are all concerned about the declining numbers of Swift Reservoir populations. We discussed a number of different issues that could be related to, or contribute to, the decline: 1)recent declines in bull trout populations throughout its range, 2) extreme storm events and reservoir turbidity, 3) planting coho, and 4) issues with the surveying methodology, etc. It would take time to sort those out and link them to the decline in numbers of bull trout and then figure out if there is some kind of management action that could be taken. Without a lot of extra research or genetic risk, it looks like we can take definitive action in increasing the Swift Reservoir numbers this field season. One action would be to collect and transport bull trout from
the power canal into Swift Reservoir. The other would be to collect and transport bull trout from the bypass reach into Swift Reservoir.

Transporting power canal bull trout:
We could begin this as soon as possible and feasible. Frank was going to investigate what was involved in doing this and get back to us via conference call during the next month. I talked with Jeff Chan about this and he is open to various methods of capturing the bull trout, including hook and line, if that makes it easier. It sounds like the power canal is pretty deep (30') and that there may be some complications with physically netting the fish in the canal.

Transporting bypass reach bull trout:
In the past, we've been reluctant to start transporting bull trout captured in the bypass reach because we've been uncertain whether they were Cougar Creek fish, and Cougar Creek numbers have been so low. There was also some concern that fish could be spawning in the bypass reach and removing them would eliminate use from a potential, yet unproven spawning area. However, the continued decline in the Swift Reservoir numbers is very worrisome and puts these other risks into perspective. There is a strong likelihood that bull trout gathering in the bypass reach are attracted to the flows coming in from the reservoir and want to get upstream. Given the declining numbers, accepting the risk of having bull trout unsuccesfully spawn in the bypass reach is probably not appropriate at this time. Therefore, we should go ahead and transport them. We talked about two ways of doing this: 1) collect a genetic sample on all bull trout captured in the bypass reach and hold those fish for 24 hours while the lab does a rapid turnaround genetics prototyping. If those fish are of Rush or Pine Creek origin, they would be immediately transported above the dam. This methodology is in use at several dams in the Pacific Northwest where a similar situation exists. 2) collect a genetic sample on all bull trout captured in the bypass reach and insert a pit tag. Then, whenever a bull trout is captured in the bypass reach, we could use the pit tag detector to determine the assignment of that fish. This would probably take several field seasons to begin showing an effect. Jeff and I discussed a third possibility which is based more on behavior than genetics: Capture bull trout in the bypass reach during the spawn timing for Cougar Creek (i.e., we assume they would be in Cougar Creek at that time if they belonged there.) Go ahead and transport these fish above the dam. Given the larger risk of population decline, we think that these fish should be transported and given the chance to spawn upstream--let them sort themselves out. Recent genetic work in the Baker system, indicates that even when "straying or dip-in" bull trout are transported upstream to where they don't technically belong, they don't appear to readily introgress with the established local populations.

So, it sounds like the next step is a phone conversation with the bull trout sub-committee and Frank will arrange that after he has looked into the methods of holding bull trout for 24 hours and the feasibility of doing the rapid turnaround genetics work.

Thanks everyone. I would appreciate your comments or corrections if my understanding is different from yours.

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AGENCY	COMMENT	RESPONSE
WDFW	In 3.1 ESTIMATE OF STAGING BULL TROUT THAT MIGRATED UP THE NORTH FORK LEWIS RIVER FROM EAGLE CLIFFS the text states, "6 (Sic) Six captured bull trout were too small (less than 14 inches) to safely tag with a Floy® tag, . . .", which is not accurate. The fourteen-inch size cut off was determined as part of the 1989 and 1991 radio telemetry study, and was driven by the size of radio tags used at that time and not the application of floy tags. For consistency, since 1994, fish smaller than 360mm have not been Floy® tagged to replicate the initial radio telemetry study. PIT tags are inserted into the fish's dorsal sinus.	It is PacifiCorp's understanding after speaking to the biologists who performed the initial surveys, that they did not feel Floy tagging fish under 14 inches was in the best interest of the fishes health. Size of radio tags used in the telemetry study may also have played a part in tagging size distinctions, comment noted.
WDFW	There is no reference to Table 3.1-2 in the text.	Comment noted and revision made.
WDFW	3.2 YALE TAILRACE SAMPLING AND TRANSPORTATION Why were alternatives to tangle nets were not attempted during 2008 as directed in the T&E Plan? Captured bull trout have been PIT tagged by PacifiCorp staff; however, there are no provisions to read PIT tags on fish when they are subsequently observed in Cougar Creek or by-pass snorkels. What is the purpose of tagging, if these tags are not subsequently read and recorded?	No alternatives to tangle nets, other than those previously tried and found to be not as effective, have been identified other than the construction of a fish trapping or collection system, which as the texts states, is in the conceptual stage. Bull trout are PIT tagged based on the understanding that the tag is retained for life if properly inserted. This allows researchers to garner valuable biological

		information from individual fish if ever handled and encountered again.
WDFW	A list of PacifiCorp installed PIT tags appear in Table 3.2-1. WDFW has been PIT tagging bull trout in the Lewis basin since 2002, using the alphanumeric hexadecimal format (Pitagis approved) form of PIT tag identification (see Appendix A). PacifiCorp staff is recording PIT tags in decimal format only. This decimal format is not compatible with the system used in the Lewis basin for the prior seven years, nor compatible with the	Comment noted, While there is an easy conversion from decimal to hexadecimal, care will be taken in coming years to represent PIT tag data in alphanumeric hexadecimal format.
WDFW	Table 3.2-1 has inconsistencies. Previous text states, "In 2008 tangle nets were the only method used and to date remain the most effective." Yet the table includes two fish captured by angling. The last group of fish in the table were identified as being too small	Comment noted and revision made.
WDFW	Table 3.2-2, second column refers to Bull trout escapement into Cougar Creek, which is misleading. This is not escapement estimate because one peak count plus additional mortalities does not represent total escapement. This methodology only reflects the highest count of fish on one given day plus any documented mortalities. The	This count is not intended to represent total escapement, but as the table states, it represents the highest known one time peak count observed within the confines of the stream and as such is that, the lowest estimate of escapement based on a peak count.

WDFW	It is inappropriate to change methodology within the same table. "Peak" counts (1995-2006) represent the largest number of fish observed on one day. The proportion estimate (last column) observed in Cougar Creek is based on that one day's count. When the methodology changes from single day counts to cumulative multi-day redd counts it is not appropriate to apply the same proportion estimate because these two methodologies are not the same. One is a single day percentage while the other is a multi-day cumulative redd count, and these two methodologies will produce different results. The percentages expressed in the last two years using redd counts appear to be substantially lower than those of the proceeding decade. This apparent decrease in abundance is not due to an actual decrease in number of fish observed, but is the result of a change in methodology; therefore, this comparison is not valid.	Both proportions of contribution of Merwin fish are based on tags observed. If escapement estimates change this does nothing to the amount of tags observed during surveys, as the methodology available for tag observances is based on visual surveys. The proportion percentage changes as the escapement number moves up or down, changing the escapement estimate methodology does nothing to change the actual amount of tagged bull trout observed within the confines of the stream.
WDFW	PacifiCorp staff recognize, "the I.P. pool was found to hold many adult bull trout between the months of June through October." Winter 2007-08 flows changed the structure of the I.P. pool, making it more difficult to capture fish with a net in this location. The I.P pool has transformed from a wide pool to a narrower slot. In 2008, many if not most of the bull trout captured in the I.P. Pool were captured by angling rather than netting. This is not reflected in the text or in table 3.3-1	Comment noted 4 of the 9 fish captured were captured via hook and line; the other 5 fish were netted. The 2008 Bull Trout Monitoring Plan does not put preference on one capture methodology over another, it simply states the capture methodologies that will be used and all stipulated methodologies were employed. Most fish were caught with a tangle net or seine.

WDFW	Two of six fish initially captured this year were repeat captures from 2007. A significant portion, 33% of this year's total, were in the same area the previous year. It is not clear what attracts these fish into this area in a consistent manner, when the recognized spawning area is Cougar Creek. Clearly a large percentage (33%) of fish are focused on this area where Swift origin waters are flowing. This should be investigated to determine if these fish are in fact Swift origin bull trout. Genetic samples should be taken and analyzed from all fish handled in this area and compared with Rush and Pine genetics.	Noted. This methodology has already been incorporated into the 2009 Bull Trout Monitoring Plan as discussed at the 2009 bull trout coordination meeting on March 20th, 2009 and subsequently directed by USFWS.
WDFW	Table 3.3-2 is confusing aside from the reference to escapement in column 2. The critical data (the last column) is not the percentage of annual observed tagged fish divided by the total tagged; but the number observed in the creek compared to the yearly escapement. Observations of by-pass tagged fish in Rush Creek only represent 10.5% (4/38) in 2007, and 3% (2/60) of all fish observed via snorkeling or cumulative redd counts. Redd count analysis will be discussed later.	Comment noted. Rush Creek should read Cougar Creek.
WDFW	**3.3.2 Baseline Assessment of the Constructed Channel of the Swift Bypass Reach** WDFW staff was not invited to participate in this assessment. While we do not have direct observations of the process, we do have concerns based on the description presented in this report. PacifiCorp staff electroshocked 0.21 miles or 338 m of the constructed channel. This is an unusually long single reach to electroshock. In most electrofishing studies, shocked reaches are 50-100m in length and multiple reaches are shocked multiple times, if necessary.	Due to the relatively small length of this reach we decided to sample the entire reach to reduce sampling bias in our estimate. Also, to reduce adverse effects and based on several studies we choose to employ single-pass electrofishing surveys.
WDFW	**3.3.2 Baseline Assessment of the Constructed Channel of the Swift Bypass Reach** The report states, "On July 28, 2008 the mouth of the channel was block-netted to satisfy the closed population assumption required to run a mark/recapture population estimate." Block nets should be positioned at both the beginning and the end of the reach being sampled.	The upstream end of the Constructed Channel terminates at a culvert that is a complete fish barrier. Therefore, no block net is needed on the upstream end.

WDFW	**3.3.2 BASELINE ASSESSMENT OF THE CONSTRUCTED CHANNEL OF THE SWIFT BYPASS REACH** For an accurate mark recapture estimate, five assumptions must be met. In the following section the assumption is described and WDFW's assessment of the validity of this assumption for the data collection effort follows in italics *1.* Every animal in the population whether tagged or untagged, has the same probability of being caught in the i^{th} sample (p_i) given that it is alive and in the population when the sample is taken: *This assumption is not valid. Larger fish are more susceptible to electrofishing than smaller fish.* *2.* Every tagged animal has the same probability of surviving (ϕ_i) from the i^{th} to the $(i+1)^{th}$ sample and of being in the population at the time of the $(i+1)^{th}$ sample, given that it is alive and in the population immediately after the i^{th} release: *This assumption is not valid as fish have an opportunity to move into the non-surveyed stream margins to avoid a second detection. Additionally, caudal fin clipped fish would not have the same evasion potential (swimming ability) as non-clipped fish.* 3. Every animal caught in the i^{th} sample has the same probability of being tagged and returned to the population: *This assumption is not valid because smaller fish and buried juveniles in gravel have a reduced potential to be captured and/or recaptured via electroshocking.* 4. Tagged animals do not lose their marks and all marks are recognized on recovery: *This assumption is valid* and 5. All samples are instantaneous, i.e., sampling time is negligible and each release is made immediately after the sample: *This assumption is valid.*	1. All marked fish were 1+ and older (larger). Therefore, because this was a closed population we believe the probability of capture for these fish was similar. 2. Recapture sampling was performed within 24 hours of initial capture. This was done to reduce mortality error or emigration/migration. No dead fish were observed in the creek or on the barrier net. Thus, we believe that the next day recapture effort is sufficient to reduce differential survival between tagged and untagged fish. We can not speculate on the swimming ability of clipped fish vs. unclipped fish. However, given the stream size it is not believed to be a factor in capture probability 3. Capturing of juvenile salmonids via electrofishing is an AFS accepted protocol and if performed correctly this is not an issue.

WDFW	All portions of the reach must be surveyed. Eliminating the shocking of stream margins violates the assumption of a closed system because it provides fish a refuge to hide, and exit the "closed" (middle channel) portion of the stream. There is also much LWD and brush in this stream providing many places for fish to hide and avoid capture. WDFW's assessment is that three of the five assumptions were violated. The recapture efficiency was low (13.5%) for a supposedly closed system, which is and indication that many fish were missed while shocking or had escaped the "closed" system.	The decision to not shock stream margins was made due to the large number of 0+ fry that we could not capture in our nets. Thus, we decided to not cause undue stress to salmonid fry inhabiting the stream margins during the time of study. The population of 1+ fish generated was an estimate and was stated as such. The low recapture efficiency number is also indicative of a large population. We do not assume that our capture efficiency electrofishing is ever 100%, whether the system is "open" or "closed".
WDFW	**3.3.3 SNORKEL SURVEYS OF SWIFT BYPASS REACH** Table 3.3-3 documents seven by-pass snorkels. As indicated previously, there were insufficient snorkelers available to effectively snorkel the by-pass and Pine Creek. Of the seven snorkels, PacifiCorp staff only participated in two. Remaining snorkels were conducted by two WDFW staff members and therefore do not represent full stream counts. The by-pass and the I.P. Hole are wide, and with only two snorkelers it is not possible to view the entire breadth of the stream in these two sampling locations; therefore, margin sections and fish present in those sections are not observed. High turbidity in this stretch also reduces observation ability. These snorkels represent, at best, an extended presence/ absence survey rather than accurate fish counts. Due to reduced staffing, the entire by-pass was not snorkeled as in previous years. Only two sections were surveyed, where counts are usually optimal. Since the number of snorkelers is inconsistent from year to year, comparisons of annual counts are not appropriate.	The 2008 Bull Trout Report does not state that the bypass snorkels were accurate counts of bull trout present within the system at the time of the survey. Snorkeling a stream, regardless of the amount of surveyors, will not achieve 100% 'capture' efficiency due to observer error and variable stream conditions, therefore the 2008 report and all previous reports are of presence/absence and a count of the fish observed

		not a count of the total number of fish present in the stream.
WDFW	The Swift Reservoir estimate has decreased drastically in recent years, which is likely due to: 1) mortality, 2) however unlikely, fish entrainment at Swift 1 Dam, with fish entering the power canal, and exiting via the drain or Swift 2 into the by-pass, or 3) spill over Swift Dam. All fish handled in the by-pass should be checked for the presence of a PIT tag to account for potential downstream migration from Swift Reservoir.	These stated reasons for decline in the estimate of Swift migrants are speculative and not based on empirical evidence. All handled fish, as stated in the Utilities annual monitoring plan, are checked for the presence of a PIT tag.
WDFW	**3.5 COUGAR CREEK SPAWNING ESTIMATE** WDFW is concerned about the use of "peak" counts (1978-201) and the mixing of peak walking and "peak" snorkel counts (2002-2007) in the past (Table 3.5-1). The number of redds reported (29) is higher than the WDFW's bi-weekly cumulative redd count of 22. No weekly breakout is provided to determine where potential discrepancies exist and superimposition of redds noted by WDFW staff may account for some of this disparity. A weekly accounting is desirable. Redds are distinct and persisted over a four week time frame.	As stated in the 2009 Bull Trout Plan, the use of "peak" counts as an escapement estimate will not be the primary methodology employed but rather redd expansion will be used. PacifiCorp surveys extended through the 1st of November, discrepancy may come from the presence of redds during every survey, or from inter-observer variability. PacifiCorp surveys are performed by the same two biologists each week to reduce this potential for error.

WDFW	How was the assessment of two adults per redd was derived? The cited literature ranged from1.2 to 4.3 fish per redd. WDFW observations on Rush Creek are 1.5 fish per redd, but we are not willing to assign a figure at this time without additional observations. The number of fish actually observed sitting on specific redds should be provided if recorded. There is an assumption that reported redd counts were completely accurate, which has not as yet been justified.	As stated in the text of the report, the actual number of spawners per redd is unknown at this time and until we are able to gather this number through either the use of a full stream spanning weir or underwater video camera, PacifiCorp is unable to define the actual number of spawners per redd. Two was chosen as a placeholder or starting point until empirical evidence is gathered.
WDFW	The text says," Along with redd counts a peak visual count of bull trout was also performed as it has since 1979 (Figure 3.5-1). This count is not considered a spawning population estimate as it relies on a peak count of bull trout observed on a single day. Rather, the annual peak counts are used to monitor Cougar Creek bull trout trends from year to year." Yet (Figure 3.5-1) is titled "Annual spawning escapement based on redd surveys and peak counts during foot and snorkel surveys of bull trout observed in Cougar Creek 1979-2008." This graph does not represent an annual spawning escapement and would be more accurately described as escapement indices.	It is titled as such because redd surveys are intended to estimate spawning escapement, the peak count was provided in the figure for comparison purposes only.
WDFW	An underwater camera was placed under the Cougar Creek Bridge during the 2007 and 2008 field seasons. WDFW has been anticipating the results of this videography. Actual observations of bull trout swimming past the camera should provide and accurate adult count. This should contribute to developing an accurate adult per redd estimate. The kokanee numbers for 2008 were not presented in this report.	The data from the underwater camera is not ready to be presented; when the analysis is completed all information will be fully disclosed. Kokanee numbers were presented in a separate report and sent to the WDFW Region 5 in December 2008.

WDFW	**3.7 SWIFT CREEK SURVEYS** Since no adults or juveniles were observed in Swift Creek during bull trout spawning time, and recorded lengths are below that usually associated with sexually mature fish, WDFW does not believe bull trout spawning occurs in Swift Creek, although bull trout routinely utilize the cove for forage.	It remains unclear what bull trout presence in Swift cove represents. While not proven, bull trout may spawn in Swift Creek and it is always difficult to prove absence of spawning. Thus, PacifiCorp will continue to evaluate Swift Creek in an attempt to observe spawning bull trout in the creek, or pre spawning bull trout in the cove.
WDFW	**3.8 BULL TROUT CONDITION FACTOR K** WDFW recognizes this as potentially useful information, but questioned the accuracy of fish weights measured in a rocking boat. Later, during the season, weights were collected at a shore station and are more accurate. The time lag of fish prey ingestion is not addressed. Bull trout have been captured with 12-inch suckers protruding out of their mouths. The K-factor of this fish will be higher than that of an identical size fish with an empty stomach. There is no ability to determine when individual fish last fed, or the amount of offal in their system.	Comment noted. PacifiCorp will purchase a digital hook scale to increase precision and accuracy of weight measurements in the field. Time lag of fish prey ingestion is not part of the K-Factor equation, therefore can not be addressed with this methodology

WDFW	WDFW also questions the appropriateness of the condition factor scale presented by Barnham and Baxter (1998). Illustrations from that scale can be located at: http://www.telusplanet.net/public/dmanders/Trout%20condition%20factor.pdf Fish in the excellent and exceptional categories (see illustration) have excessive girth and potentially have large quantities of mesentery fat, particularly surrounding the pyloric caeca. Fish in the excellent and exceptional categories do not appear healthy for the Lewis system. Bull trout observed in Cougar Creek (Yale) snorkels did not appear in as dire shape as Figure 3.8-1. indicates. Fish in the creek appeared robust, not snakelike, as the Barnham and Baxter) poor and extremely poor categories would indicate. Were Yale Reservoir or by-pass reach fish presented in this graph? Hopefully, differences in K-Factor will be apparent in years with poor fish growth (turbid reservoir conditions) versus years of good growth, and may provide insights into annual growth and spawning condition.	Comment noted. Being the first year of this data gathering activity, there was no historic data to compare it to. As more information is gathered, this scale will most likely be refined and reflect conditions specific to the Lewis River basin.
WDFW	**4.0 CONCLUSION** Staff has provided a wrap up of data presented, but provide no real conclusions. There is no discussion of the rapid and stark decline of bull trout in Swift Reservoir and the upper Lewis River, or its' potential cause. Adult estimates dropped from 1,287 in 2004 to only 380 in 2008, which represents a 70 % decline within four years. The decline is also reflected in reduced CPUE during netting efforts and fewer fish observed during snorkeling surveys. No proposals to address this decline are provided.	This document is a "monitoring" report and as such data gathered during the monitoring season is presented. It is not appropriate for PacifiCorp to speculate on causes for the recent declines exhibited in the abundance data.
WDFW	Cougar Creek counts are more confusing than ever, as terminology and methodologies have been combined and interchanged. There is some value to the history of peak counts as a measure of relative abundance over time, but this is more of a qualitative rather than quantitative measure. If in some years the peak is a reported as walking count and in others a snorkel count, as is the case in this report, this historical data becomes invalid. If a third methodology, cumulative redd counts, is now introduced we are no longer legitimately able to document trends in abundance due to the change methodologies employed to collect this data.	See response to similar comment above. "If a third methodology, cumulative redd counts, is now introduced we are no longer legitimately able to document trends in abundance due to the change in methodologies employed to collect this

		data” Every monitoring methodology has to have a starting point, agree it would not be very useful to compare new methodologies to old, but that is not being presented in this report. The redd numbers are compared to previous redd numbers as this is the direction agreed to by the USFWS and other regulatory entities.
WDFW (Rawding)	My overall comments are that PacifiCorp has made some improvements in the bull trout monitoring program. These include the separate tagging of 36-45cm bull trout to address assumptions required for an unbiased estimate of abundance, the use of video to estimate bull trout abundance in Cougar Creek, and the K condition factor to develop baseline for non-abundance metrics. However, the current monitoring program could be improved. While these recommendations address the PacifiCorp report, if the management agencies (WDFW, USFWS, and USFS) were more actively engaged in development and	Comment noted
WDFW (Rawding)	Swift Bypass Surveys The same comments about goal development and assessing of assumptions from the Swift Reservoir Bull Trout Population Estimates apply to the Swift Bypass Surveys. Again, ***if the assumptions are not addressed than it is unlikely the estimate is unbiased***. I have some additional concerns. First, the population estimate was the combined age 1+ or older whitefish, coastal cutthroat trout, and brook trout from 68 to 440mm. Based on my experience different species and size classes have differential susceptibility to capture using electroshocking. An alternate approach may have been to obtain separate species and size class estimates. If size selectivity test indicated the population estimate could be combined then a single estimate would be made and species and estimates by species and size classes would be the result of a the proportion of that group.	We agree that stratified sampling for each species would be beneficial, however, our sample size was not large enough thus we pooled all fish and the estimate represents abundance of all 1+ and older species.

WDFW (Rawding)	Second, it was not noted in the recapture event that released fish were differentially marked or held and released until the completion of the recapture event. If released fish were not marked or not held until the completion of electroshocking on the second day, then this is sampling with replacement and is more appropriately estimated with a binomial model (Seber 1982, page 61), rather than Chapman's modification, which is based on a hypergeometric model. This would reduce the point estimate to 279. Seber (1982, page 60) recommended that at least seven recapture for an unbiased population estimate, which was not met.	This method includes sampling with replacement and as indicated in the comment below abundance should have been estimated with the Bailey variation, which is based on a binomial probability distribution, of the Peterson estimate. Despite this, the estimate did not change significantly with either method, thus it was not changed in the final report. Also, noted in the comment below we will strive to recapture at least 7 marked fish during future efforts to reduce statistical bias.
WDFW (Rawding)	Using a Bayesian approach given by Mantyniemi and Romakkaniemi (2002) with vague priors the mean, median, and mode from a binomial model were estimated to be 466, 392, and 244, respectively. There is great uncertainty in the estimate (Figure 1), and the 95% CI was estimated to be from 172 to 1,195 fish. If this estimate is unbiased and to be used as baseline, we would expect that if we were to demonstrate restoration is successful, the confidence intervals would not overlap (Bradford et al. 2005). Therefore the lower bound of the post-restoration estimate would exceed 1,195 age 1+ or older fish. Of course if the population estimate was more precise (with 44 marks released but increased sampling effort increased (tripled) the captured fish to 111 in the second event with 15 recaptures), the 95% CI would be 229 to 570, a 50% decrease in the upper bound. Therefore, unless you believe restoration is likely to improve the population more than 5 or 6 fold, you may want to consider adding years to the abundance estimates in the bypass, otherwise you will not have sufficient power to detect substantial benefits of restoration.	We agree that increased sampling effort would increase precision and reduce the confidence intervals reported, however, given time constraints this was not possible and would have increased potential for multiple electrofishing effects. The CI for our approach while large is not as large as reported with WDFW's approach. We used a universally accepted method (albeit a Baileys variation of the Peterson estimate would have been more appropriate with the

		replacement of marked fish) which was intended to provide an abundance estimate. In future sampling we will attempt to achieve a recapture of marked fish that is greater than 7 to make the estimate more practical and to define trends as a result of habitat improvements.
WDFW (Rawding)	I have other concerns with the approach to evaluate the effects of restoration on this reach. It seems that a single snapshot (1 day in July) for two years makes it very difficult to draw conclusions about the population in the bypass reach let alone the possible change due to restoration. If agencies really desire to test the effectiveness of restoration, I would encourage a Before-After-Control-Impact (BACI) design, rather then the Before-After design being implemented in the current monitoring program (Stewart-Oaten et al. 1986). Also population estimates should be made at multiple times each year, if possible monthly or seasonally.	We agree that seasonal sampling should occur; however, time constraints precluded this as this effort was not a regulatory requirement. Instead this work is intended to provide an understanding of abundance prior to habitat work to be completed in 2009.
WDFW (Rawding)	Bull Trout Condition Factor I like the approach to use metrics other than abundance to help assess bull trout status in Swift Reservoir. The condition factor is one approach that could be useful. However, the authors should detail the exact application to test differences in condition factors. The authors indicated that there was measurement error and provide a regression. When linear regression is used to model the K factor and there is measurement error included in the condition factor estimates, the result is an "error in the variables" problem. Therefore, it is essential to estimate the amount of error in the weight estimates using a known weight under different conditions, so there could be some assessment of the size of the error.	Comment noted. In 2009, PacifiCorp will purchase a calibrated digital hook scale to reduce error associated with weight measurements in the field.

WDFW (Rawding)	An alternate approach to the condition factor may be the use of growth curves (Hilborn and Walters 1992, page 410). For example, if scales and lengths were collected for all captured bull trout, a von Bertalanffy curve could be used to estimate maximum length and the growth coefficient. We could compare the estimates of these parameters to assess changes in the productivity of the reservoir between years or periods of years. If weights were collected this same assessment could be made for weight. Of course this is contingent of being able to accurately age bull trout using scales.	The reading of bull trout scales has always been problematic and subject to substantial error; therefore, we do not believe this would be an acceptable methodology for bull trout.