

**Threatened and Endangered Species**  
**Annual Bull Trout Monitoring Report**  
**2006**

**North Fork Lewis River Hydroelectric Projects**

|                    |                      |
|--------------------|----------------------|
| <i>Merwin</i>      | <i>FERC No. 935</i>  |
| <i>Yale</i>        | <i>FERC No. 2071</i> |
| <i>Swift No. 1</i> | <i>FERC No. 2111</i> |
| <i>Swift No. 2</i> | <i>FERC No. 2213</i> |

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## 1.0 INTRODUCTION

PacifiCorp and Cowlitz County PUD (the Utilities) are involved in various bull trout (*Salvelinus confluentus*) and salmonid monitoring programs on the North Fork Lewis River in southwest Washington. These programs are designed to meet requirements contained in the Utilities existing operating licenses and Settlement Agreement (SA) for the Merwin, Yale, Swift No. 1, and Swift No. 2 hydroelectric projects. This report also serves to meet requirements contained in the 2003 Biological Opinions issued to the Utilities by the U.S. Fish and Wildlife Service (USFWS). All activities are developed in consultation with the USFWS and the Washington Department of Fish and Wildlife (WDFW). This report provides results from programs that are either ongoing or have been completed in 2006. For methods and general descriptions of the ongoing programs please refer to the annual plan submitted to the USFWS, WDFW and FERC in May 2006.

During 2006, the Utilities participated in, funded or initiated ten (10) monitoring programs. Of those programs, 6 are ongoing and will continue in 2007. In addition to the 6 ongoing monitoring programs, a number of single-pass electrofishing surveys were completed on tributaries to Pine Creek and the Lewis River including the Swift bypass reach downstream of Swift dam. Purposes of these surveys included: (1) to determine presence of bull trout juveniles, (2) conduct Limiting Factors Analysis (LFA), (3) complete a rainbow trout (*Oncorhynchus mykiss*) genetics study on Siouxon and Cussed Hollow creeks, and (4) conduct presence-absence surveys on tributaries to Merwin, Yale, and Swift reservoirs for Forest Practice Act purposes. A map of the study area for all programs is shown in Figure 1.0-1.

Bull Trout and Salmonid Programs completed or ongoing in 2006 include:

1. Swift reservoir spawner population estimate (ongoing)
2. Yale tailrace sampling and transportation (ongoing)
3. Swift No. 2 tailrace sampling (ongoing)
4. Swift bypass snorkel and electroshocking surveys (ongoing)
5. Cougar Creek spawning estimate and fish passage inventory (ongoing)
6. Swift reservoir rainbow trout stomach content analysis (ongoing)
7. P8 bull trout juvenile survey (completed)
8. Bull trout LFA presence/absence surveys (completed)
9. Rainbow trout genetics study (completed)
10. Forest Practice Act fish presence/absence survey (completed)

## **2.0 MONITORING PROGRAMS**

This section provides results for the 10 programs conducted in 2006. One project – the Muddy River snorkel survey, which was originally proposed in the plan, was cancelled due to poor visibility that persisted throughout the summer survey period.

### **2.1 SWIFT RESERVOIR BULL TROUT SPAWNING ESTIMATE**

#### MARKING:

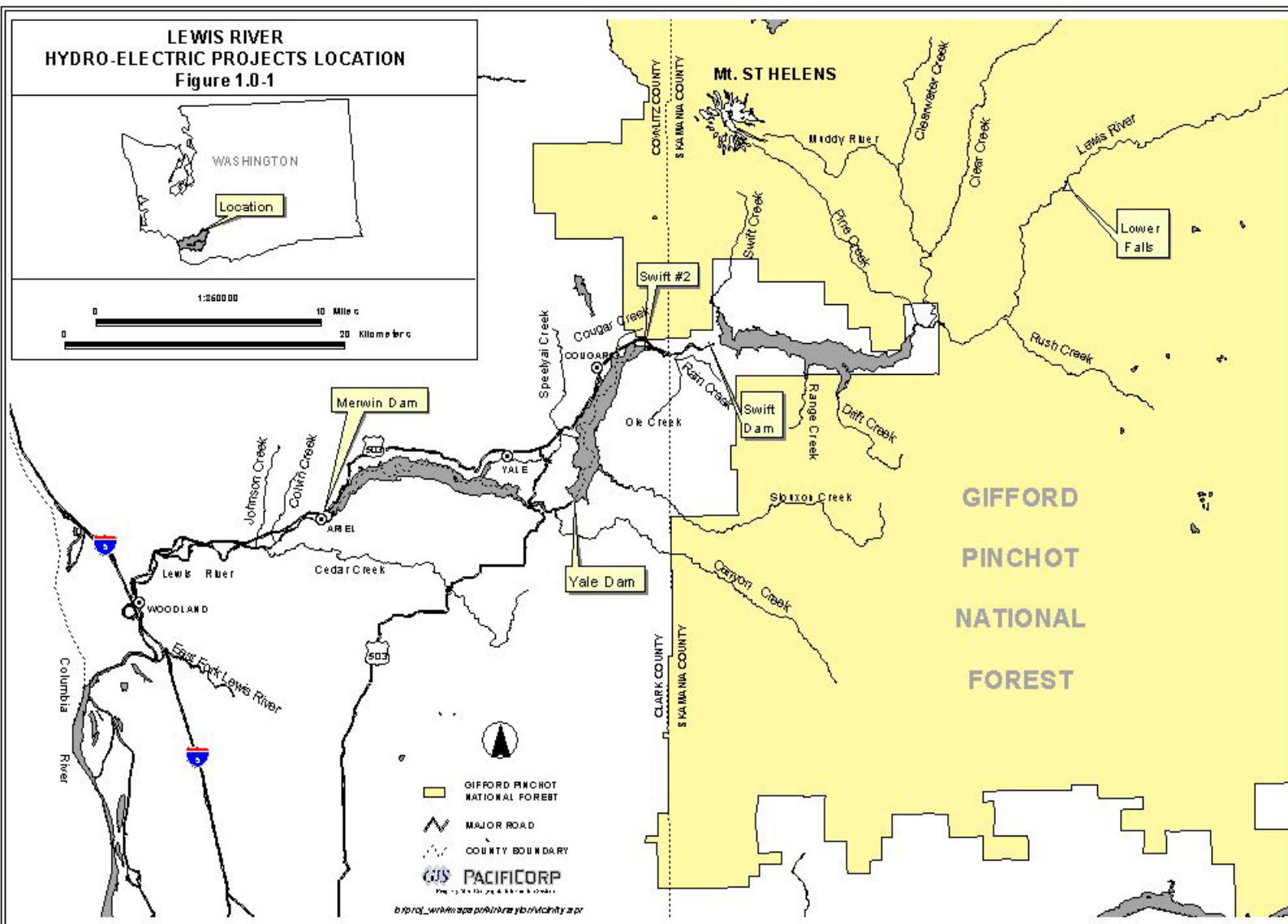
Gill net collection activities at the upper end of Swift reservoir began on April 21st and continued through July 12, 2006 (Appendix A). In total, 10 gill netting days were completed during the period. A total of 134 bull trout were captured in Swift reservoir. Of these, 110 were tagged with an orange colored floy tag, 8 were too small for a floy tag, and 8 were current year recaptures (Appendix A). In addition to the current year recaptures, 21 captured bull trout had tags from previous years bringing the total capture rate of previously handled fish to 22% (29 of 134). All captured fish also receive a PIT tag to provide long-term and unique identification for each bull trout.

#### SNORKEL SURVEYS:

Snorkel surveys were conducted on Rush and Pine creeks between July 26th and September 20th (Table 2.1-1). Snorkel surveys on Rush Creek include a portion of the North Fork Lewis River known as the “Rush Creek hole”. The area is thought to be used as a staging area for bull trout ascending Rush Creek and is about 200 feet long. It is located at the confluence of Rush Creek and the North Fork Lewis River. Bull trout counts on Rush Creek occur from the mouth (including the Rush Creek Hole) upstream past the Forest Service road 90 Bridge for about 1000 yards (about RM 0.85). Snorkel surveys were also conducted on the mainstem Lewis River and included in the spawning estimate calculation. On Pine Creek, surveys are typically conducted between RM 2.0 and 4.5. Surveys on Pine Creek are limited due to inaccessibility.

For 2006, a spawning population of 1,011 bull trout (95% CL) was estimated as ascending the North Fork Lewis River from Swift reservoir (Figure 2.1-1). This is slightly less than estimates for 2005 which were also less than estimates from 2004.

**LEWIS RIVER  
HYDRO-ELECTRIC PROJECTS LOCATION  
Figure 1.0-1**



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Table 2.1-1. Bull trout snorkel survey results (recapture) – 2006

| Survey Date  | Number of Bull Trout Observed |                 |               |                 | Total      |
|--------------|-------------------------------|-----------------|---------------|-----------------|------------|
|              | Rush Creek                    |                 | Pine Creek    |                 |            |
|              | <i>Tagged</i>                 | <i>Untagged</i> | <i>Tagged</i> | <i>Untagged</i> |            |
| 26-Jul       | 20                            | 172             |               |                 | 192        |
| 2-Aug        |                               |                 | 11            | 54              | 65         |
| 9-Aug        | 20                            | 185             |               |                 | 205        |
| 17-Aug       |                               |                 | 9             | 54              | 63         |
| 23-Aug       | 20                            | 192             |               |                 | 212        |
| 6-Sep        |                               |                 | 2             | 18              | 20         |
| 13-Sep       | 9                             | 112             |               |                 | 121        |
| 20-Sep       |                               |                 | 6             | 40              | 46         |
| <b>TOTAL</b> | <b>69</b>                     | <b>661</b>      | <b>28</b>     | <b>166</b>      | <b>924</b> |

Source: Jim Byrne, WDFW

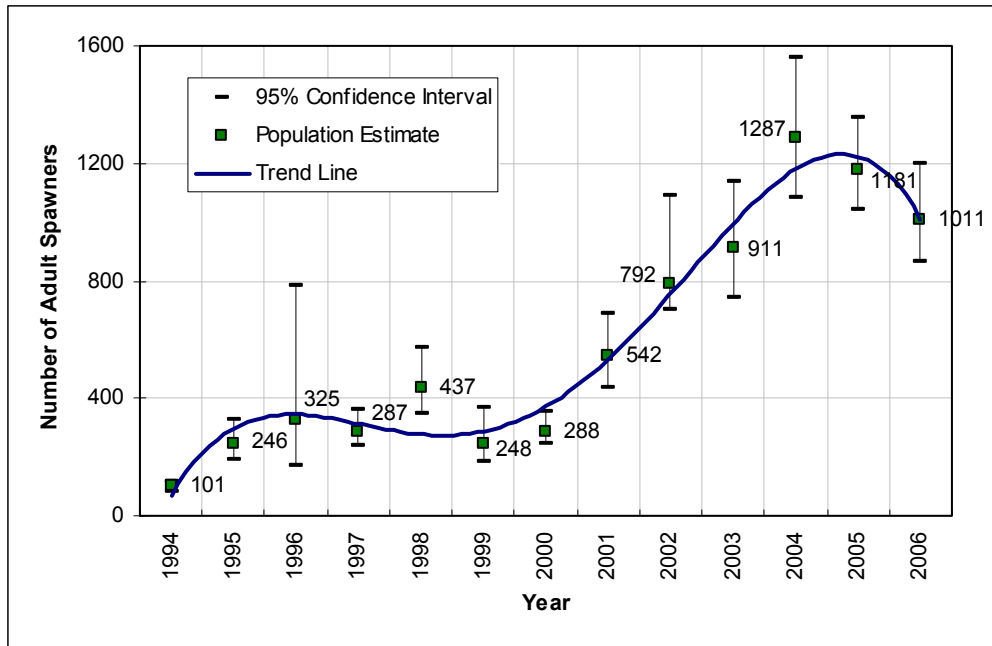


Figure 2.1-1. Spawning population estimate of bull trout in Swift reservoir for the years 1994 through 2006. (Source: Jim Byrne, WDFW)

**Table 2.1-2. Tabular data of Swift reservoir bull trout mark-recapture population estimates 1994 - 2006. (Source: Jim Byrne, WDFW)**

| <b>Year</b> | <b>Lower Bound (95% CL)</b> | <b>Upper Bound (95% CL)</b> | <b>Spawning Population Estimate</b> |
|-------------|-----------------------------|-----------------------------|-------------------------------------|
| 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                                |

## **2.2 YALE TAILRACE SAMPLING AND TRANSPORTATION**

The Utilities, in cooperation with the WDFW and USFWS, annually net and transport bull trout from Yale tailrace to the mouth of Cougar Creek, a Yale reservoir tributary. A total of 102 bull trout have been captured at 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 July and ending in early September. 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. Larger nets, in both area and mesh size, have been deployed in the past; however, they were less effective at capturing bull trout. 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 before being pulled is less than 10 minutes. 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. Once biological information is gathered and a floy tag is inserted, the bull trout is placed in a 6-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 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

In coordination with the 2003 Biological Opinion, Settlement Agreement and FERC licenses for the Lewis River projects, the Utilities continue to seek more effective and less intrusive methods to collect bull trout from the Yale tailrace. In 2005, a large (225' X 28') beach seine was used in an attempt to actively collect bull trout from the tailrace. Mesh size ranged from 2 to 4 inch square. The methodology used included feeding the net from shore and using a jet sled to feed the net in a circular pattern from the shore. The net was then dragged back to the shore.

While the net was very effective in capturing all types of larger fish present in the tailrace, it would become 'snagged' on large boulders close to shore. This resulted in nearly all of the fish escaping from the net. Because this snagging of the net occurred in all sets it was decided to discontinue its use for the remainder of the season.

In 2006, based on the nets initial effectiveness, the net was modified to allow pursing the net in the middle of the tailrace - thus eliminating the need to bring the net to shore and potentially snag on the large boulders present there. This technique was expected to capture large numbers of fish and allow a less intrusive method to be used, but the purse seine proved to be cumbersome and not feasible with only one boat.

The Utilities will, in 2007, continue to test the purse seine with additional resources to properly set and purse the seine.

## Yale Netting Results

At the Yale tailrace, attempts to net bull trout were completed from June 1<sup>st</sup> through August 31<sup>st</sup>, 2006. Biological information and release information of the captured bull trout is shown in Table 2.2-1. No bull trout mortalities were observed as a result of netting and transportation activities.

The number of bull trout captured at the Yale tailrace remained the same from the previous year. Five Bull trout were captured in 2006. The Yale tailrace capture number has been steadily on the decline, possibly showing that our efforts have been a success in transferring fish from Merwin to Yale Reservoirs.

All 5 bull trout captured in the Yale tailrace were transported to Yale reservoir and released at Cougar Park. Other species captured in order of frequency included: kokanee (*Oncorhynchus nerka*), largescale suckers (*Catostomus macrocheilus*), northern pikeminnow (*Ptychocheilus oregonensis*), coastal cutthroat (*Oncorhynchus clarki*), and rainbow trout (*Oncorhynchus mykiss*.)



**TABLE 2.2-1: Capture information of bull trout netted in the Yale Tailrace – 2006**

| Date      | Tag # | Tag Color | Fork Length (mm) | Comments            |
|-----------|-------|-----------|------------------|---------------------|
| June 01   | 1501  | Green     | 561              | Left eye old injury |
| June 08   |       |           |                  | No bull trout       |
| June 15   |       |           |                  | No bull trout       |
| June 22   |       |           |                  | No bull trout       |
| July 06   | 00001 | Green     | 620              | Healthy fish        |
| July 06   | 00002 | Green     | 450              | Healthy fish        |
| July 06   | 00003 | Green     | 600              | Healthy fish        |
| July 13   |       |           |                  | No bull trout       |
| July 20   | 00004 | Green     | 368              | Healthy fish        |
| August 03 |       |           |                  | No bull trout       |
| August 16 |       |           |                  | No bull trout       |
| August 31 |       |           |                  | No bull trout       |

Of the 102 bull trout captured at the Yale tailrace since 1995, 71 have been transported to the mouth of Cougar Creek (Table 2.2-2). Remaining fish have been tagged and released back into Merwin reservoir. 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 2.2-3. This contribution is measured by the proportion of bull trout transported from the Yale tailrace that comprise the total estimated population observed during our annual foot and snorkel surveys of Cougar Creek. Of the five fish released in Yale reservoir (in 2006), one bull trout (with green floy tag) was observed during annual spawning surveys in September and October (see section 2.5).

**TABLE 2.2-2. Number of bull trout collected from Yale tailrace (Merwin reservoir) and transferred to the mouth of Cougar Creek (Yale tributary): 1995 – 2006.**

| 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 <sup>^</sup> |
| 2004         | 8                                 | 3  | 5*                                       | 0               |
| 2005         | 5                                 | 5  | 0  | 0               |
| 2006         | 5                                 | 5  | 0  | 0               |
| <b>TOTAL</b> | <b>102</b>                        | <b>71</b>                                | <b>21</b>                                | <b>10</b>       |

\* 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). <sup>^</sup> Please refer to 2003 annual report for description of mortalities

**TABLE 2.2-3. Contribution of Merwin bull trout transported to Cougar Creek: 1995-2006**

| YEAR         | Bull trout escapement into Cougar Creek <sup>^</sup> | Number of bull trout released | Number of bull trout observed with tags during surveys* |          |          |          |          |          | Proportion of Merwin bull trout transported to Yale that ascend Cougar Creek** |
|--------------|--|-------------------------------|---|----------|----------|----------|----------|----------|--|
|              |  |                               | Orange  | White    | Yellow   | Blue     | Pink     | 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%  |
| <b>TOTAL</b> | <b>177</b>   | <b>71</b>                     | <b>1</b>  | <b>2</b> | <b>8</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>24% (average)</b>   |

**NOTES:**

\* Orange = 2005; White= 2004; Blue = 2003, Yellow = 1995, 1996, 1998, 2002; Pink =1997, 2000; Green = 1997,2006 to denote bull trout captured at the Cougar Creek fish weir

\*\* 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.

<sup>^</sup> Bull trout escapement estimate represents peak count plus any mortalities or tagged fish observed that are known to not be represented in peak count.

### 2.3 SWIFT NO. 2 TAILRACE SAMPLING

In 1999, the Utilities and the WDFW began netting the Swift No. 2 tailrace as part of requirements contained in amendments to Article 51 of the Merwin license. No netting was done from 2001 to 2005 because of the canal failure in 2002 and subsequent rebuilding. Capture efforts were restarted in 2006.

Capture of fish from the tailrace involves setting passive gill nets in and around the tailrace area. Nets are fished in a similar manner as nets in the Yale tailrace (see Section 2.2).

The Swift No. 2 tailrace was netted on three separate occasions. No bull trout were captured. The only fish captures were on July 19 – the first netting effort (Table 2.3-1). Efforts to net bull trout in the tailrace were abandoned after August 10 due to poor capture rates.

Table 2.3-1. Fork lengths of fish species captured during netting efforts in the Swift No. 2 tailrace.

| Date            | Species       | Fork Length (mm) | Notes          |
|-----------------|---------------|------------------|----------------|
| July 19, 2006   | Rainbow       | 255              |                |
|                 | Cutthroat     | 390              |                |
|                 | Cutthroat     | 390              |                |
|                 | N. Pikeminnow | 362              |                |
|                 | N. Pikeminnow | 390              |                |
| July 27, 2006   | NONE          |                  | No fish caught |
| August 10, 2006 | NONE          |                  | No fish caught |

### 2.4 SWIFT BYPASS SURVEYS

The Swift bypass reach consists of the former Lewis River channel (bypass) between the Swift No. 1 and Swift No. 2 hydroelectric projects. Under the Settlement Agreement, the maximum flow that can be released from the canal drain is 47 cfs. The October 2006 Section 401 Water Quality Certifications for Swift No. 1 and Swift No. 2 calls for 14 cfs to be released from the canal drain. The drain flows into a short reach (termed the “Constructed Channel”) that is unaffected by spill events at Swift dam and is 0.21 miles long. This channel then joins the active bypass reach and provides flows into the bypass reach downstream of this juncture. Snorkel and electrofishing surveys are performed to establish species abundance, distribution, habitat use and composition.

One single-pass electrofishing survey was conducted of the ¼ mile long “constructed channel” on August 24 to determine fish species composition and abundance (table 2.4-1). 13 coastal cutthroats (*Oncorhynchus clarki*) were observed along with one brook trout (*Salvelinus fontinalis*). No bull trout were observed.

Table 2.4-1. Species observed in the “Constructed Channel” electrofishing survey

| Species         | Fork Length (mm) |
|-----------------|------------------|
| Brook trout     | 71               |
| Cutthroat trout | 109              |
| Cutthroat trout | 133              |
| Cutthroat trout | 118              |
| Cutthroat trout | 86               |
| Cutthroat trout | 55               |
| Cutthroat trout | 42               |
| Cutthroat trout | 49               |
| Cutthroat trout | 165              |
| Cutthroat trout | 129              |
| Cutthroat trout | 144              |
| Cutthroat trout | 149              |
| Cutthroat trout | 150              |
| Cutthroat trout | 129              |

In addition to the one electrofishing survey of the “constructed channel”, several snorkel surveys of the bypass reach were conducted by the Utilities and WDFW personnel (Table 2.4-2). Surveys areas were sporadic based on safety and time constraints, but generally covered the section between the constructed channel confluence downstream to the braided channels and the bridge (detailed maps of the survey area are provided in the 2006 Annual Plan).

Table 2.4-2. Bull trout observed during snorkel surveys of the Swift bypass (old Lewis River channel) in 2006.

| Date  | Along FR 90 | IP Bridge pool | Total bull trout observed |
|-------|-------------|----------------|---------------------------|
| 06/29 | 8           | 13             | 21                        |
| 07/16 | 9           | 4              | 13                        |
| 08/24 | 4           | 5              | 9                         |
| 09/11 | 3           | 5              | 8                         |
| 09/25 | 1           | 9              | 10                        |
| 10/03 | 2           | 5              | 7                         |
| 10/11 | 1           | 5              | 6                         |
| 10/18 | 3           | 6              | 9                         |
| 10/26 | 0           | 3              | 3                         |

During the snorkel surveys, no bull trout were handled. Most bull trout were observed in the large pool below the bridge crossing often referred to as the “IP” Bridge pool. Largescale suckers were the most predominant species observed during the surveys. Large rainbow and cutthroat trout along with kokanee salmon were also present in good numbers.

## 2.5 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. Surveyors also count the number of bull trout observed in the creek during these surveys. In 2006 the Utilities conducted 4 Cougar Creek foot surveys. PacifiCorp and WDFW personnel also conducted several snorkel surveys of the creek. The 2006 count is based on information obtained from both foot and snorkel surveys.

Nine bull trout redds were identified in the upper one-third of the creek (mostly during the October 23rd survey). Bull trout redds are not easily identified in the creek due to very little algae, and it is likely that additional redds were present but undetected by the surveyors. No bull trout were observed spawning in the creek in 2006

The peak count of 26 bull trout represents a peak count of 24 adults during a single snorkel survey plus two other unique bull trout identified during a foot survey on October 5th (Figure 2.5-1). This count is not considered a spawning population estimate as there is no accurate method to determine individual fish. Rather, the annual peak counts are used to monitor trends in the creek from year to year. The two bull trout identified during the foot survey were added to the snorkel count peak due to the presence of a green floy tag in one (representing it was transferred from Merwin to Yale in 2006) and the head from the freshly killed other. The one bull trout mortality was noted this year. The estimate of 26 bull trout is considered the minimum number of bull trout that ascended Cougar Creek in 2006.

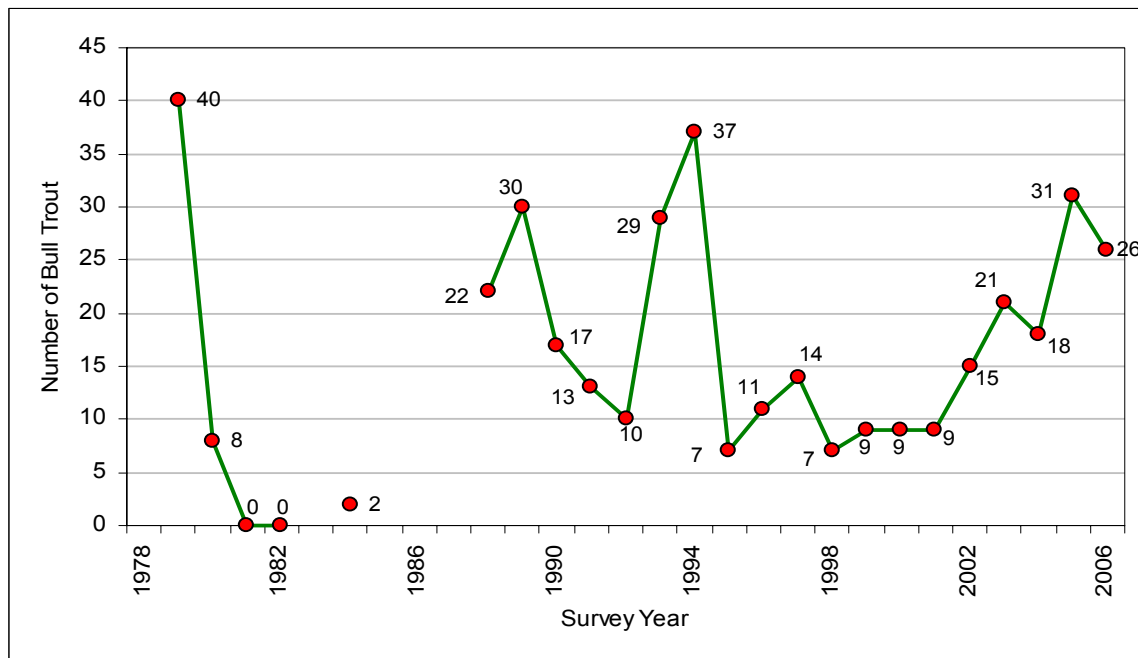


Figure 2.5-1. Annual peak counts of bull trout observed in Cougar Creek 1979-2006.

## 2.6 Stomach Contents Analysis

A total of 132 rainbow trout, cutthroat trout, mountain whitefish and bull trout were lavaged (Figures 2.6-1 through 2.6-4) in 2006. The primary purpose of this program was to determine if hatchery rainbow trout planted into Swift reservoir prey upon juvenile bull trout in the Eagle Cliff 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 2007.

Lavaging procedures including using a flexible 1/8 to 1/4 inch diameter tube fastened to a pressure spray gun that used the boat's internal spray down pump for pressure. The flexible tubing reduces the potential for abrasion and puncturing of the esophagus. Stomach contents are directed into a clear flask and then preserved in a solution of either 10 percent formalin or grain alcohol. All containers are labeled with date, fish species, fish fork length and location.

Of all the rainbow trout sampled, none were found with juvenile bull trout in their stomachs. Stomach contents of rainbow in the Eagle Cliff area were dominated by Ephemeroptera, Trichoptera, Plecoptera and Diptera. Hymenoptera were primarily ants, however, some large wasps were also observed. The only fish observed in rainbow trout stomachs were sculpins. Of particular interest, was the abundance of small white eyed-eggs that were found in a significant number of rainbow and other species. These eggs could not be identified, but were likely from sculpin or possibly suckers.

When comparing the Eagle Cliff fish to other locations such as the Yale tailrace (Figure 2.6-3), it is clear that the diet of the fish in these two locations differ substantially. The diet of trout captured in the Yale tailrace was composed mainly of fish and surface adult insects. That is, no larval insects were found in the Yale tailrace area. We believe this is due to a lack of stream flowing conditions in the area and thus the lack of stream dwelling insects. It should also be noted that the number of empty stomachs found in the Yale tailrace was significantly higher than those found in Eagle Cliff.

Most bull trout stomachs sampled were empty. Of the bull trout with food it appears that fish and fish eggs were the preferred diet (Figure 2.6-4). The sample size was very low in 2006 (n=6) and further stomach lavage will need to be performed to make any meaningful conclusions with regard to bull trout diet composition at Eagle Cliff.

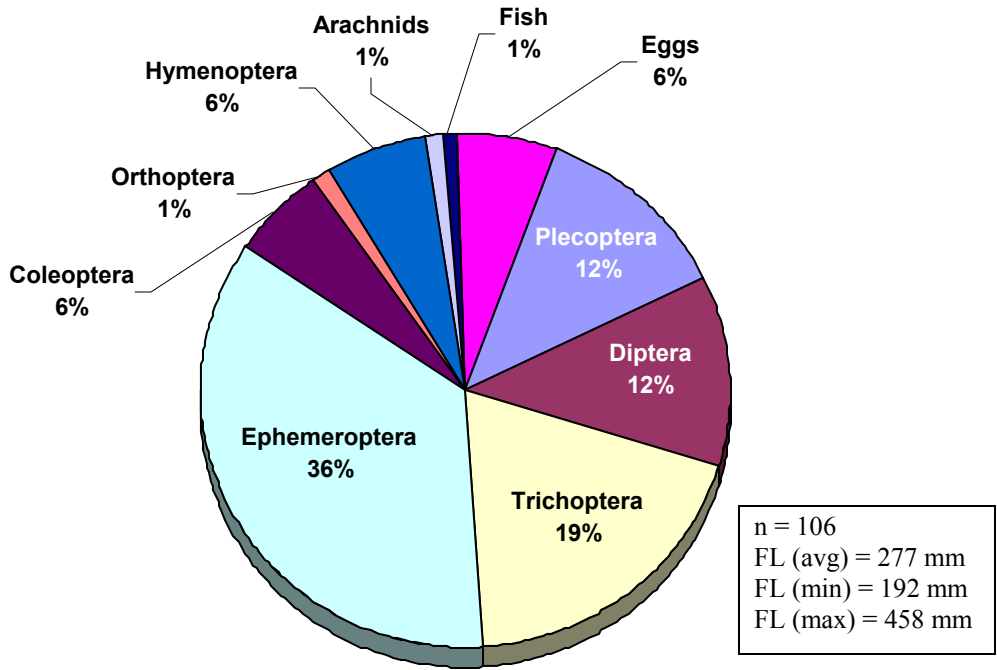


Figure 2.6-1. Stomach contents of rainbow trout netted near Eagle Cliff – Swift Reservoir.

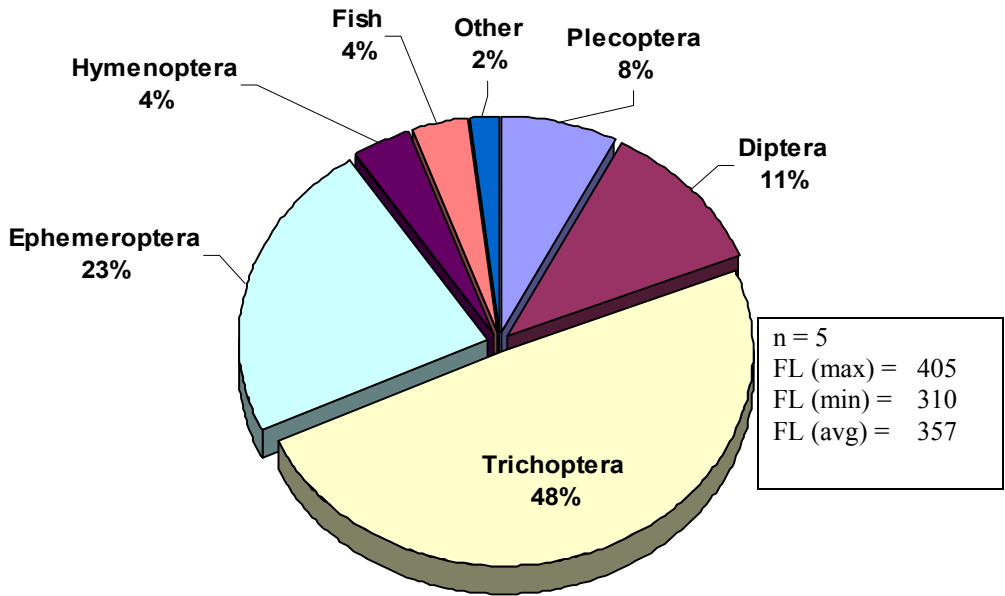


Figure 2.6-2. Stomach contents of Whitefish netted near Eagle Cliff – Swift Reservoir.

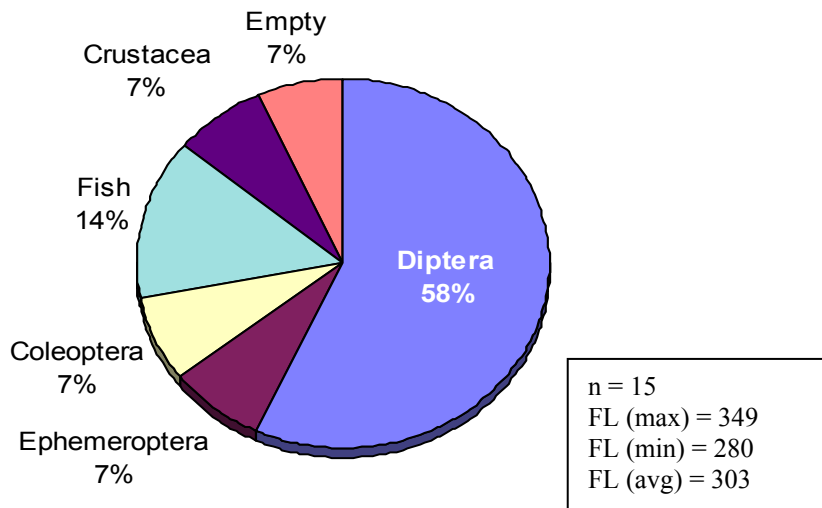


Figure 2.6-3. Stomach contents of Rainbow and Cutthroat netted in Yale Tailrace.

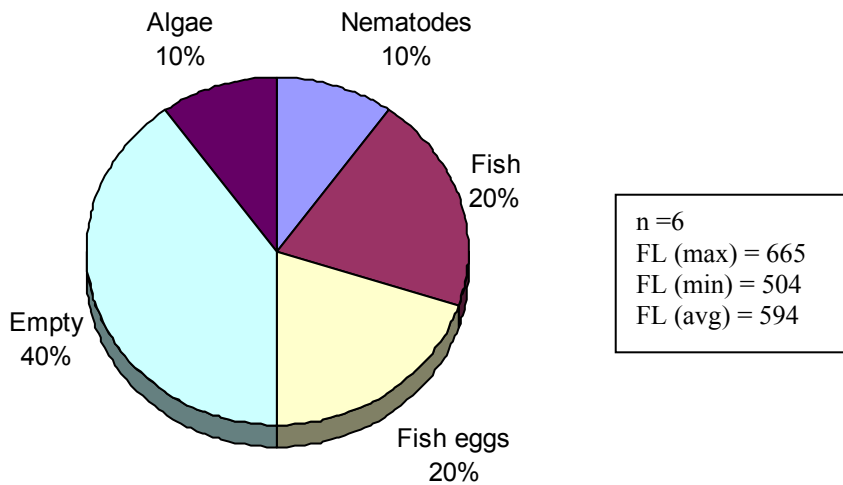


Figure 2.6-4. Stomach contents of bull trout netted at Eagle Cliff – Swift Reservoir.



A single-pass electrofishing survey was conducted July 24<sup>th</sup>, 2006 on Pine Creek tributary 'P8'. The survey was done from the mouth of P8 to approximately 0.92 miles upstream (Figure 2.7-1). In all, 21 fish were handled: 4 Coho (*Oncorhynchus kisutch*), 16 coastal cutthroat (*Oncorhynchus clarki*), and 1 bull trout (*Salvelinus confluentes*) (Table 2.7-1). The purpose of the survey was to determine the presence of juvenile bull trout and thereby, identifying its use and suitability as spawning and rearing habitat for bull trout. It is possible, that the single juvenile bull trout collected may have come from Pine Creek proper. However, this is highly unlikely due to the velocity and gradient observed at the mouth of P8.

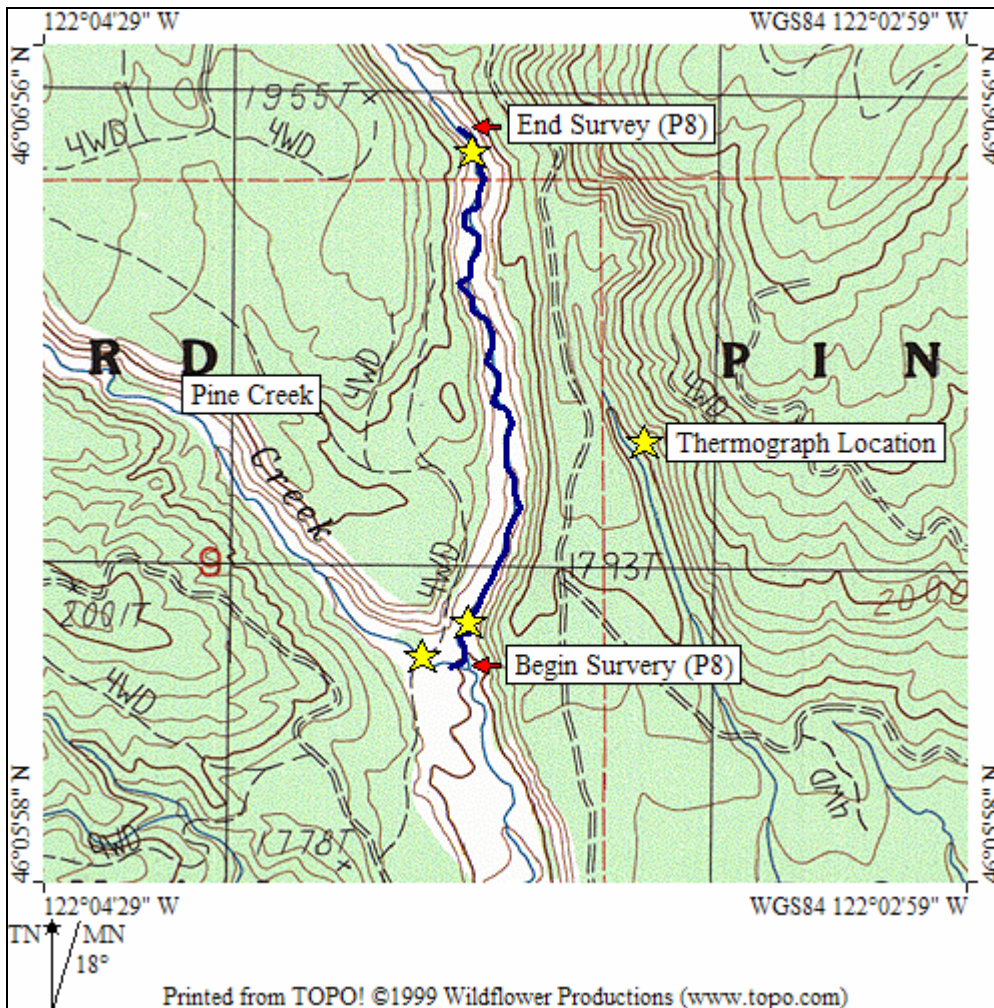


Figure 2.7-1. Survey area of P8 denoting the starting and end points of survey and location of thermographs placed in Pine Creek and P8.

Thermographs placed in P8 and Pine Creek from July 24 through September 20 indicated that P8 averages slightly more than 1 °C warmer than Pine Creek during at the highs of the day, and approximately 0.5 °C warmer for the daily lows (Figure 2.7-2). Both creeks fall well below 8 °C on a daily basis.

Table 2.7-1. List of species captured and measured during a single-pass electrofishing survey in “P8” – a tributary to Pine Creek.

| Species           | Fork Length (mm) |
|-------------------|------------------|
| Coho              | 79               |
| Coho              | 74               |
| Coho              | 77               |
| Coho              | 55               |
| <b>Bull trout</b> | <b>145</b>       |
| Cutthroat         | 44               |
| Cutthroat         | 42               |
| Cutthroat         | 37               |
| Cutthroat         | 37               |
| Cutthroat         | 44               |
| Cutthroat         | 53               |
| Cutthroat         | 127              |
| Cutthroat         | 95               |
| Cutthroat         | 54               |
| Cutthroat         | 110              |
| Cutthroat         | 88               |
| Cutthroat         | 120              |
| Cutthroat         | 126              |
| Cutthroat         | 93               |
| Cutthroat         | 95               |
| Cutthroat         | 49               |

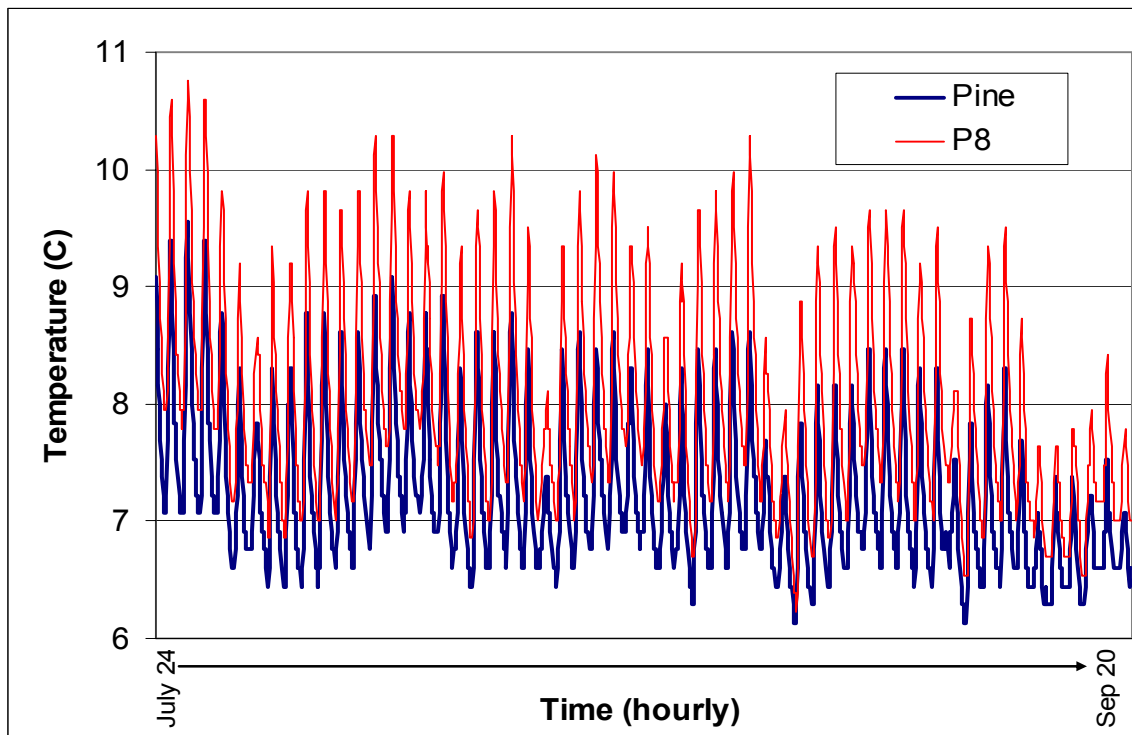


Figure 2.7-2. Comparison of hourly temperature between Pine Creek and P8 (see Figure 2.7-1 for thermograph location).

## 2.8 Bull trout Limiting Factors Analysis

As part of ongoing efforts to try to find an additional Lewis River local population of bull trout, a bull trout Limiting Factors Analysis (LFA) was performed this year on the Lewis River sub-basin above Merwin dam. The LFA sought out streams that could feasibly support bull trout other than the already known Pine Creek and Rush Creek upstream of Swift Reservoir and Cougar Creek in Yale Reservoir. Streams were surveyed for a number of habitat criteria and the streams that best fit the unique needs of bull trout were subsequently surveyed for the presence/absence of bull trout juveniles, an indication of successfully spawning adults.

Tributaries of Merwin and Swift reservoirs were surveyed using single-pass electroshocking techniques (table 2.8-1).

All seven streams were surveyed from the mouth to the anadromous fish barrier. Of the seven streams, due to various habitat limiting factors, none were found to hold juvenile bull trout. One stream, Swift Creek, was found to have adult or sub-adult bull trout. On two separate occasions bull trout were seen, once during a snorkel survey and once during a single pass electrofishing survey.

**Table 2.8-1. Electroshocked streams during bull trout LFA and the species found therein.**

| <b>Stream</b>       | <b>Coho</b> | <b>Cutthroat</b> | <b>Rainbow</b> | <b>Bull</b> | <b>Kokanee</b> |
|---------------------|-------------|------------------|----------------|-------------|----------------|
| Jim Creek           | no          | yes              | no             | no          | yes            |
| Indian George Creek | no          | yes              | yes            | no          | yes            |
| Brooks Creek        | no          | yes              | no             | no          | yes            |
| Swift Creek         | no          | yes              | yes            | yes         | no             |
| Drift Creek         | yes         | yes              | yes            | no          | no             |
| Range Creek         | yes         | yes              | no             | no          | no             |
| S10                 | yes         | yes              | yes            | no          | no             |

## 2.9 Rainbow trout genetics study

On September 13<sup>th</sup>-14<sup>th</sup>, 2006 Cussed Hollow and upper Siouxon creeks (table 2.9-1) were single-pass electrofished to capture rainbow trout (*Oncorhynchus mykiss*) genetic samples. Cussed Hollow Creek was sampled from the mouth to the anadromous fish barrier and Siouxon Creek was sampled above the anadromous fish barrier until 50 samples were procured. The study sought to collect genetic material for a Lewis River genetic baseline of rainbow trout to be used as a comparison tool in future studies. Rainbow trout were upper caudal clipped to avoid recapture.

Table 2.9-1. Data collected from Siouxon and Cussed Hollow rainbow trout electrofishing surveys.

| Stream        | Rainbow trout | Mortalities |
|---------------|---------------|-------------|
| Siouxon creek | 50            | 2           |
| Cussed Hollow | 27            | 3           |

## 2.10 Forest Practice Laws fish presence/absence surveys

In accordance with Forest Practice Laws concerning riparian buffer zones on fish bearing streams single-pass electroshocking surveys were performed on 18 named and unnamed streams along the 3 Lewis River reservoirs to determine the presence of any species of fish. Table 2.10-1 explains the location of each stream and the species, if any, found therein.

Table 2.10-1. Forest Practice Laws stream survey locations and species, if any, found.

| Stream Name              | Location (T/R/S) | Reservoir Tributary             | Fish Found                        |
|--------------------------|------------------|---------------------------------|-----------------------------------|
| 1 unnamed stream         | T6N/R3E/S19      | Merwin                          | 2 cutthroat trout                 |
| 2 unnamed streams        | T6N/R3E/S25      | Merwin                          | 2 cutthroat trout                 |
| 2 unnamed streams        | T6N/R3E/S21      | Merwin                          | none                              |
| Marble Creek             | T6N/R2E/S33      | Merwin                          | 1 cutthroat trout                 |
| 1 unnamed stream         | T6N/R2E/S24      | Merwin                          | none                              |
| 1 unnamed stream         | T6N/R3E/S30      | Buncombe Hollow Creek tributary | 1 cutthroat trout                 |
| Speelyai Diversion Works | T6N/R4E/S17      | Merwin/Yale                     | 2 sculpin, 1 lamprey, 1 cutthroat |
| 1 unnamed stream         | T6N/R4E/S19      | Yale                            | none                              |
| 1 unnamed stream         | T6N/R4E/S21      | Yale                            | none                              |
| 1 unnamed stream         | T6N/R4E/S16      | Yale                            | none                              |
| 1 unnamed stream         | T6N/R4E/S4       | Yale                            | 2 cutthroat                       |
| 2 unnamed streams        | T7N/R5E/S25      | Swift                           | none                              |
| 3 unnamed streams        | T7N/R5E/S29      | Swift 2 Power Canal             | 3 brook trout, 1 cutthroat trout  |

## 3.0 CONCLUSION

As directed under the FERC order amending Article 51 of the Merwin License and the 2003 Biological Opinion, the Utilities are to determine whether fish stocking is affecting listed bull trout populations. The Utilities use the data contained in this report to determine if adverse effects are being observed in spawning populations of bull trout in the Lewis River basin. The determination is made based, in part, on the assumption that an estimate of spawning escapement provides a reasonable estimator of reservoir population size. Other indicators include the condition of bull trout netted in Swift and Merwin (Yale tailrace) reservoirs. All bull trout are inspected for signs of hooking by anglers. Hooking scars, lures or hooks

present in mouth and the presence of ingested monofilament line are all signs that bull trout are either being targeted or inadvertently hooked by anglers fishing the popular rainbow trout fishery in Swift, or kokanee fisheries in Yale and Merwin. Lastly, netting provides insight into age class structure. In some years, a high percentage of 3 and 4 year old bull trout are caught. The presence of this young age class is encouraging and is assumed to add stability to the population.

In evaluating these indices, it appears that bull trout spawning escapement is experiencing a downward trend in Swift reservoir. In Yale, bull trout spawning escapement is at least stable and in looking at the Cougar Creek estimates, is staying on the recent upward trend line. More accurate population estimate techniques will need to be employed in order to get a better understanding of the actual number of bull trout that are ascending Cougar Creek to spawn. With recent sightings of more and more redds in Cougar Creek, annual weekly redd surveys done during peak bull trout spawning times may be an effective tool to provide this number. Capture efficiency stayed low again this year in the Yale tailrace (Merwin reservoir). However, this may be an indication that the transportation activities in the Yale tailrace are thinning this population and more importantly providing spawning opportunity for those captured bull trout. Activities at Yale tailrace will continue to be monitored and changes to the program will only be instituted through coordination with the USFWS and WDFW.

The 2006 data does not definitively support that bull trout are at a greater risk of extinction than prior to the license amendment of Article 51. This year's population estimate is the third highest since 1994, despite a near-term downtrend and a notable decline in the number of bull trout observed in Rush Creek. Whether this downtrend continues is unknown and will only be determined through continued mark-revisual estimates.

The need for an evaluation of the effects of hatchery supplementation on bull trout does not appear to be necessary at this time. However, due to the changes in the size of rainbow trout planted into Swift in 2006 and into the future, we propose to continue our efforts in evaluating the prey base of these larger hatchery rainbow trout.

## APPENDIX A

### SWIFT RESERVOIR BULL TROUT CAPTURE DATABASE FOR 2006

| Record # | Date      | Fork Length (mm) | Floy color | Floy # | PIT #           | Recap/Color | Notes                          |
|----------|-----------|------------------|------------|--------|-----------------|-------------|--------------------------------|
| 1        | 4/21/2006 | 447              | Red        | 1339   | 3D91HBF23C8385  |             | PRE-OPENING DAY SAMPLE         |
| 2        | 4/21/2006 | 543              | Red        | 1340   | 3D91HBF2405419  |             | PRE-OPENING DAY SAMPLE         |
| 3        | 4/22/2006 | 440              | Red        | 1341   | 3D91HBF240509B  |             | PRE-OPENING DAY SAMPLE         |
| 4        | 4/23/2006 | 443              | Red        | 1342   | 3D91HBF23CA17A  |             | PRE-OPENING DAY SAMPLE         |
| 5        | 4/24/2006 | 422              | Red        | 1343   | 3D91HBF2405638  |             | PRE-OPENING DAY SAMPLE         |
| 6        | 5/10/2006 | 626              | Red        | 1      | 3D91H257C6A5B1B |             | LINE OUT ANUS                  |
| 7        | 5/10/2006 | 566              | Red        | 2      | 3D91H257C66B455 |             |                                |
| 8        | 5/10/2006 | 620              | Red        | 3      | 3D91H257C6AAEB9 |             |                                |
| 9        | 5/10/2006 | 757              | Red        | 4      | 3D91H1BF1586F3B | No Floy     | RECAP SET NET TAGGED 7/17/02   |
| 10       | 5/10/2006 | 570              | Red        | 5      | 3D91H257C666DF5 |             | SETNET                         |
| 11       | 5/10/2006 | 566              | Red        | 6      | 3D91H257CA595D  |             | SET NET                        |
| 12       | 5/10/2006 | 508              | Red        | 7      | 3D91H257C6A3E1A |             |                                |
| 13       | 5/17/2006 | 547              | Red        | 8      | 3D91H257C66AF9F |             | SET NET                        |
| 14       | 5/17/2006 | 558              | Red        | 9      | 3D91H257C66745D |             | SET NET                        |
| 15       | 5/24/2006 | 723              | Red        | 10     | 3D91H1BF10E78EC | C19         | TAG IN 2002 424 ,2005,684 2006 |
| 16       | 5/24/2006 | 644              | Red        | 11     | 3D91H1BF13BB1FA | W271        | TAG IN 2003                    |
| 17       | 5/24/2006 | 472              | Red        | 12     | 3D91H257C665547 |             |                                |
| 18       | 5/24/2006 | 521              | Red        | 13     | 3D91H257C6A956F |             |                                |
| 19       | 5/24/2006 | 570              | Red        | 14     | 3D91H257C665DC5 |             |                                |
| 20       | 5/24/2006 | 640              | Red        | 15     | 3D91H257C667394 |             |                                |
| 21       | 5/24/2006 | 579              | Red        | 16     | 3D91H257C6A580C |             |                                |
| 22       | 5/24/2006 | 605              | Red        | 17     | 3D91H257C6A6463 |             |                                |
| 23       | 5/31/2006 | 540              | Red        | 18     | 3D91H1BF24051C0 | C75         | TAG IN 6/15/2005,              |
| 24       | 5/31/2006 | 644              | Red        | 19     | 3D91H257C667002 |             |                                |
| 25       | 5/31/2006 | 635              | Red        | 20     | 3D91H257C66526D |             |                                |
| 26       | 5/31/2006 | 515              | Red        | 21     | 3D91H1BF23C9CC7 |             | TAG IN 6/28/2005,              |
| 27       | 5/31/2006 | 486              | Red        | 22     | 3D91H257C66BA10 |             |                                |
| 28       | 5/31/2006 | 330              |            |        | 3D91H257C66B624 |             | Too Small                      |
| 29       | 5/31/2006 | 600              | Red        | 23     | 3D91H257C6A7C3E |             |                                |
| 30       | 5/31/2006 | 576              | Red        | 24     | 3D91H257C6663EC |             |                                |
| 31       | 6/7/2006  | 525              | Red        | 25     | 3D91H257C667347 |             |                                |
| 32       | 6/7/2006  | 718              | Red        | 76     | 3D91H257C6A46B2 |             |                                |
| R        | 6/7/2006  |                  |            |        | 3D91H1BF1586F3B | R04         | 3rd capture this year          |
| 33       | 6/7/2006  | 608              | Red        | 77     | 3D91H257C6651FC |             |                                |
| 34       | 6/7/2006  | 461              | Red        | 78     | 3D91H257C6AC1C9 |             |                                |
| 35       | 6/14/2006 | 382              | Red        | 79     | 3D91H257C6A46EE |             |                                |
| 36       | 6/14/2006 | 387              | Red        | 80     | 3D91H257C6A49BA |             |                                |
| 37       | 6/14/2006 | 585              | Red        | 81     | 3D91H257C66A25C |             |                                |
| 38       | 6/14/2006 | 656              | Red        | 82     | 3D91H257C669A77 |             |                                |
| 39       | 6/14/2006 | 425              | Red        | 83     | 3D91H257C6A3F28 |             |                                |
| 40       | 6/14/2006 | 565              | Red        | 84     | 3D91H257C66BB28 |             | LENGTH MAY BE OFF              |
| R        | 6/14/2006 |                  |            |        | 3D91H257C66AF9F | R08         | TAGGED 5/17/06                 |
| 41       | 6/14/2006 | 610              | Red        | 85     | 3D91H257C66AAC2 |             |                                |
| 42       | 6/14/2006 | 598              | Red        | 86     | 3D91H1BF23DBA0C |             |                                |

| Record # | Date      | Fork Length (mm) | Floy color | Floy # | PIT #            | Recap/Color | Notes             |
|----------|-----------|------------------|------------|--------|------------------|-------------|-------------------|
| 43       | 6/14/2006 | 568              | Red        | 87     | 3D91H257C666811  |             |                   |
| 44       | 6/21/2006 | 655              | Red        | 88     | 3D91H1BF10E8990  | W240        | TAGGED 6/10/2003  |
| 45       | 6/21/2006 | 715              | Red        | 89     | 3D91H1BF10E7D47  |             | TAGGED 5/20/2005  |
| 46       | 6/21/2006 | 668              | Red        | 90     | 3D91H257C6A4AEE  |             |                   |
| 47       | 6/21/2006 | 408              | Red        | 91     | 3D91H257C6A55D6  |             |                   |
| 48       | 6/21/2006 | 606              | Red        | 92     | 3D91H257C6A3DF7  |             |                   |
| 49       | 6/21/2006 | 437              | Red        | 93     | 3D91H257C66C3AD  |             |                   |
| 50       | 6/21/2006 | 690              | Red        | 94     | 3D91H257C66C180  |             |                   |
| R        | 6/21/2006 |                  |            |        | 3D91H257C6A3F28  | R83         |                   |
| 51       | 6/21/2006 | 614              | Red        | 95     | 3D91H1BF23C3780  | C87         | TAGGED 6/23/05 at |
| 52       | 6/21/2006 | 578              | Red        | 96     | 3D91H257C6A65B5  |             |                   |
| 53       | 6/21/2006 | 491              | Red        | 97     | 3D91H257C6A6113  |             |                   |
| 54       | 6/21/2006 | 492              | Red        | 98     | 3D91H257C66C300  |             |                   |
| 55       | 6/21/2006 | 537              | Red        | 99     | 3D91H257C66B546  |             |                   |
| 56       | 6/21/2006 | 501              | Red        | 100    | 3D91H257C66B08E  |             |                   |
| 57       | 6/21/2006 | 620              | Red        | 101    | 3D91H257C6A5BE7  |             |                   |
| 58       | 6/21/2006 | 382              | Red        | 102    | 3D91H257C666AAA  |             |                   |
| R        | 6/21/2006 | 644              |            |        | 3D91H1BF13BB1FA  | W271, R11   | TAGGED 5/24/06    |
| 59       | 6/21/2006 | 680              | Red        | 103    | 3D91H257C6AC4BD  |             |                   |
| 60       | 6/21/2006 | 511              | Red        | 104    | 3D91H257C6A5095  |             |                   |
| 61       | 6/21/2006 | 601              | Red        | 105    | 3D91H257C66AB6C  |             |                   |
| 62       | 6/21/2006 | 620              | Red        | 106    | 3D91H257C66AAA0  |             |                   |
| 63       | 6/21/2006 | 636              | Red        | 107    | 3D91H257C6A6136  |             |                   |
| 64       | 6/21/2006 | 558              | Red        | 108    | 3D91H257C66B3ED  |             |                   |
| 65       | 6/21/2006 | 563              | Red        | 109    | 3D91H257C66BA2D0 |             |                   |
| 66       | 6/21/2006 | 588              | Red        | 110    | 3D91H257C6A5D74  |             |                   |
| 67       | 6/21/2006 | 575              | Red        | 111    | 3D91H257C667BA8  |             |                   |
| 68       | 6/21/2006 | 510              | Red        | 112    | 3D91H1BF157FAB6  | C117        | TAGGED 7/13/05    |
| 69       | 6/21/2006 | 609              | Red        | 113    | 3D91H257C6A53226 |             |                   |
| 70       | 6/21/2006 | 574              | Red        | 114    | 3D91H257C66A4E1  |             |                   |
| 71       | 6/21/2006 | 642              | Red        | 115    | 3D91H1BF158E36E  |             |                   |
| 72       | 6/21/2006 | 555              | Red        | 116    | 3D91H257C6A46EE  | P7548       |                   |
| 73       | 6/21/2006 | 233              |            |        | 3D91H257C6A3012  |             | Too Small         |
| 74       | 6/27/2006 | 403              | Red        | 117    | 3D91H257C6A5979  |             |                   |
| 75       | 6/27/2006 | 374              | Red        | 118    | 3D91H257C6672FA  |             |                   |
| 76       | 6/27/2006 | 665              | Red        | 119    | 3D91H257C66546F  |             |                   |
| 77       | 6/27/2006 | 610              | Red        | 120    | 3D91H257C6698D1  |             |                   |
| 78       | 6/27/2006 | 600              | Red        | 121    | 3D91H257C66AC87  |             |                   |
| 79       | 6/27/2006 | 631              | Red        | 122    | 3D91H1BF157F0C8  | B52         | TAGGED 6/16/04    |
| 80       | 6/27/2006 | 628              | Red        | 123    | 3D91H257C6A79D3  |             |                   |
| 81       | 6/27/2006 | 641              | Red        | 124    | 3D91H257C6A4673  |             |                   |
| 82       | 6/27/2006 | 504              | Red        | 125    | 3D91H257C667B7D  |             |                   |
| 83       | 6/27/2006 | 655              | Red        | 126    | 3D91H257C6A4E03  |             |                   |
| 84       | 6/27/2006 | 731              | Red        | 127    | 3D91H257C66AD22  |             |                   |



| Record # | Date      | Fork Length (mm) | Floy color | Floy # | PIT #           | Recap/Color | Notes  |
|----------|-----------|------------------|------------|--------|-----------------|-------------|--|
| R        | 6/27/2006 |                  |            |        | 3D91H257C6A3E1A | R7          |  |
| 85       | 6/27/2006 | 446              | Red        | 128    | 3D91H257C66AC59 |             |  |
| 86       | 6/27/2006 | 577              | Red        | 129    | 3D91H257C667C0F |             |  |
| 87       | 6/27/2006 | 695              | Red        | 130    | 3D91H1BF10E1784 | C76         | POWER CANAL 6/14/02 at 399; RECAP 6/15/05 at 680 |
| 88       | 6/27/2006 | 605              | Red        | 131    | 3D91H257C6A425E |             |  |
| 89       | 6/27/2006 | 538              | Red        | 132    | 3D91H257C6A83EE |             |  |
| 90       | 6/27/2006 | 694              | Red        | 133    | 3D91H257C669793 |             |  |
| 91       | 6/27/2006 | 232              |            |        | 3D91H257C6A50FA |             | Too Small  |
| 92       | 6/27/2006 | 476              | Red        | 134    | 3D91H1BF1525E5B | C40         |  |
| 93       | 6/27/2006 | 700              | Red        | 135    | 3D91H257C66AE98 |             | TAGGED 6/1/05 at 375                             |
| 94       | 6/27/2006 | 396              | Red        | 136    | 3D91H257C6A4F29 |             |  |
| 95       | 6/27/2006 | 355              | Red        | 137    | 3D91H257C66AEC1 |             |  |
| 96       | 6/27/2006 | 726              | Red        | 138    | 3D91H1BF10E37BB | W 208       | TAGGED 5/21/03 at 483                            |
| 97       | 7/5/2006  | 596              | Red        | 139    | 3D91H257C6678B2 |             |  |
| 98       | 7/5/2006  | 635              | Red        | 140    | 3D91H257C6A3970 |             |  |
| 99       | 7/5/2006  | 278              |            |        | 3D91H257C66A707 |             | Too Small  |
| R        | 7/5/2006  |                  |            |        | 3D91H257C66AAA0 | R106        |  |
| R        | 7/5/2006  |                  |            |        | 3D91H257CA595D  | R6          |  |
| R        | 7/5/2006  |                  |            |        | 3D91H257C66B546 | R99         |  |
| 100      | 7/5/2006  | 389              | Red        | 141    | 3D91H257C6A5780 |             |  |
| 101      | 7/5/2006  | 634              | Red        | 142    | 3D91H1BF23DA811 | No Floy     | TAGGED 6/16/04 at 434 TAG GONE                   |
| 102      | 7/5/2006  | 591              | Red        | 143    | 3D91H1BF23DAA65 | C90         | TAGGED 6/25/05 at 523                            |
| 103      | 7/5/2006  | 548              | Red        | 144    | 3D91H257C6A4E03 | C54         | TAGGED 6/08/05 at 445                            |
| 104      | 7/5/2006  | 586              | Red        | 145    | 3D91H257C6A642B |             |  |
| 105      | 7/5/2006  | 554              | Red        | 146    | 3D91H257C6A8FAC |             |  |
| 106      | 7/5/2006  | 375              | Red        | 147    | 3D91H257C66B3F1 |             |  |
| 107      | 7/5/2006  | 583              | Red        | 148    | 3D91H1BF2408523 | G65         | TAGGED 6/15/05 at 454                            |
| 108      | 7/5/2006  | 592              | Red        | 149    | 3D91H1BF23C1C80 | G107        | TAGGED 7/06/05 at 510                            |
| 109      | 7/5/2006  | 555              | Red        | 150    | 3D91H1BF2406398 |             | TODD COULD NOT FUND                              |
| 110      | 7/5/2006  | 365              | Red        | 151    | 3D91H257C66AEB8 |             |  |
| 111      | 7/5/2006  | 676              | Red        | 152    | 3D91H1BF158E911 | B93         | TAGGED 6/28/05 at 660; 7/7/04 at 537             |
| 112      | 7/12/2006 | 238              |            |        | 3D91H257C6A7396 |             | Too Small  |
| 113      | 7/12/2006 | 490              | Red        | 153    | 3D91H257C66A55A |             |  |
| 114      | 7/12/2006 | 638              | Red        | 154    | 3D91H257C6A47AD |             |  |
| 115      | 7/12/2006 | 354              |            |        | 3D91H257C666EE7 |             | Too Small  |
| 116      | 7/12/2006 | 349              |            |        | 3D91H257C6666C7 |             | Too Small  |
| R        | 7/12/2006 |                  |            |        | 3D91H257C63F28  | R83         |  |
| 117      | 7/12/2006 | 516              | Red        | 155    | 3D91H257C667066 |             |  |
| 118      | 7/12/2006 | 604              | Red        | 156    | 3D91H257C66C341 |             |  |
| 119      | 7/12/2006 | 586              | Red        | 157    | 3D91H257C6A4E12 |             |  |
| 120      | 7/12/2006 | 390              | Red        | 158    | 3D91H257C66A005 |             |  |
| 121      | 7/12/2006 | 315              |            |        | 3D91H257C6A66D2 |             | Too Small  |
| 122      | 7/12/2006 | 584              | Red        | 159    | 3D91H1BF24087F1 |             |  |

| Record # | Date      | Fork Length (mm) | Floy color | Floy # | PIT #           | Recap/Color | Notes     |
|----------|-----------|------------------|------------|--------|-----------------|-------------|-----------|
| 123      | 7/12/2006 | 369              | Red        | 160    | 3D91H1BF23DB5D8 |             |           |
| 124      | 7/12/2006 | 484              | Red        | 161    | 3D91H1BF23C9758 |             |           |
| 125      | 7/12/2006 | 330              |            |        | 3D91H257C6A3BE5 |             | Too Small |

## APPENDIX B

### YALE TAILRACE BULL TROUT CAPTURE DATABASE FOR 2006

| LIVE FISH CAUGHT | LIVE FISH TO YALE | INITIAL CAPTURE DATE | LOCATION | TAG # | TAG TYPE | LENGTH (mm) | COMMENTS  |
|------------------|-------------------|----------------------|----------|-------|----------|-------------|---|
| 97               | 66                | 6/1/2007             | Yale TR  | 1501  | GREEN    | 561         | Old Eye Injury  |
| 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 stickeback; no bull trout           |
| 101              | 71                | 8/16/2006            | Yale TR  |       |          |             | CT 300 mm various fish bones  |
| 101              | 71                | 8/31/2006            | Yale TR  |       |          |             | SCCS, no bull trout   |

## APPENDIX C

### COUGAR CREEK LOG JAM PHOTOS (2006)

**Log Jam No. 1 – Looking upstream**



## Log Jam No. 1 – Looking Downstream



**Log Jam No. 2 – Looking Upstream**





**Log Jam No. 2 – Looking Downstream**

