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The Integrated Status and Effectiveness Monitoring Program

Entiat River Status and Trend Snorkel Surveys And Rotary Smolt Trap Operation in Nason Creek

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INTRODUCTION

The Integrated Status and Effectiveness Monitoring Program (ISEMP – BPA project #2003-0017) has been created as a cost effective means of developing protocols and new technologies, novel indicators, sample designs, analytical, data management and communication tools and skills, and restoration experiments that support the development of a region-wide Research, Monitoring and Evaluation (RME) program to assess the status of anadromous salmonid populations, their tributary habitat and restoration and management actions.

The most straightforward approach to developing a regional-scale monitoring and evaluation program would be to increase standardization among status and trend monitoring programs. However, the diversity of species and their habitat, as well as the overwhelming uncertainty surrounding indicators, metrics, and data interpretation methods, requires the testing of multiple approaches. Thus, the approach ISEMP has adopted is to develop a broad template that may differ in the details among subbasins, but one that will ultimately lead to the formation of a unified RME process for the management of anadromous salmonid populations and habitat across the Columbia River Basin.

ISEMP has been initiated in three pilot subbasins, the Wenatchee/Entiat, John Day, and Salmon. To balance replicating experimental approaches with the goal of developing monitoring and evaluation tools that apply as broadly as possible across the Pacific Northwest, these subbasins were chosen as representative of a wide range of potential challenges and conditions, e.g., differing fish species composition and life histories, ecoregions, institutional settings, and existing data.

ISEMP has constructed a framework that builds on current status and trend monitoring infrastructures in these pilot subbasins, but challenges current programs by testing alternative monitoring approaches. In addition, the ISEMP is:

1) Collecting information over a hierarchy of spatial scales, allowing for a greater flexibility of data aggregation for multi-scale recovery planning assessments, and

2) Designing methods that:

- a) Identify factors limiting fish production in watersheds;
- b) Determine restoration actions to address these problems;
- c) Implement actions as a large-scale experiment (e.g. Before After Control Impact, or BACI design), and
- d) Implement intensive monitoring and research to evaluate the action's success.

The intent of the ISEMP project is to design monitoring programs that can efficiently collect information to address multiple management objectives over a broad range of scales. This includes:

• Evaluating the status of anadromous salmonids and their habitat;

• Identifying opportunities to restore habitat function and fish performance, and

• Evaluating the benefits of the actions to the fish populations across the Columbia River Basin.

The multi-scale nature of this goal requires the standardization of protocols and sampling designs that are statistically valid and powerful, properties that are currently inconsistent across the multiple monitoring programs in the region. Other aspects of the program will aid in the ability to extrapolate information beyond the study area, such as research to elucidate causal mechanisms, and a classification of watersheds throughout the Columbia River Basin. Obviously, the scale of the problem is immense and the ISEMP does not claim to be the only program working towards this goal. As such, ISEMP relies heavily on the basin's current monitoring infrastructure to test and develop monitoring strategies, while acting as a coordinating body and providing support for key elements such as data management and technical analyses. The ISEMP also ensures that monitoring programs can address large-scale management objectives (resulting largely from the ESA) through these local efforts. While the ISEMP maintains a regional focus it also returns the necessary information to aid in management at the smaller spatial scales (individual projects) where manipulations (e.g., habitat restoration actions) actually occur.

The work captured in this report is a component of the overall Integrated Status and Effectiveness Monitoring Program, and while it stands alone as an important contribution to the management of anadromous salmonids and their habitat, it also plays a key role within ISEMP. Each component of work within ISEMP is reported on individually, as is done so here, and in annual and triennial summary reports that present all of the overall project components in their programmatic context and shows how the data and tools developed can be applied to the development of regionally consistent, efficient and effective Research, Monitoring and Evaluation.

PURPOSE OF THIS PROJECT

1) To conduct annual snorkel surveys to assess the variable fish species composition, population densities and niche preferences by salmonids at select sites within the Entiat basin. Snorkel events were conducted using single-pass observations at twenty-five 'Status and Trend' sites within the Entiat basin.
2) To operate a rotary smolt trap in Nason Creek to estimate the juvenile production, and temporal variability of juvenile spring Chinook, and steelhead emigrating from Nason Creek within the Wenatchee River.

CHAPTER 1: ENTIAT RIVER STATUS and TREND SNORKEL SURVEYS

ABSTRACT

The Yakama Nation Mid-Columbia Field Station conducted snorkel surveys at twenty-five 'Status and Trend' sites in the Entiat basin from 7/10/2007-9/13/2007 as part of the ISEMP project. A total of 2,330 fish from 10 species were enumerated. Rainbow trout/steelhead, being the most abundant, accounted for 63.9% of the total fish. Cutthroat trout accounted for 10.9%, brook trout (3.7%), bull trout (3.0%), Chinook (2.6%), whitefish (9.7%), and the remaining 6.1% included suckers, minnows, sculpin and dace. Night surveys were not conducted as part of this study.

A. Introduction

This is the second annual progress report to BPA for the 2007 snorkel surveys conducted within the Entiat basin.

In a continuing effort to fulfill study obligations for the Bonneville Power Administration's Integrated Status and Effectiveness Monitoring Program (ISEMP), Yakama Nation staff, with assistance from Terraqua, Inc., conducted snorkel surveys at twenty-five 'Status and Trend' sites within the Entiat River Subbasin beginning July 10th and ending September 13th of 2007.

Snorkel surveys are one part of an ongoing ISEMP monitoring strategy that is intended to assess differing fish species composition, population densities and niche preferences.

B. Purpose of this project

The objective of this study is to conduct annual snorkel surveys to assess the variable fish species composition, population densities and niche preferences by salmonids at select sites within the Entiat basin. Snorkel events were conducted using single-pass observations at twenty-five 'Status and Trend' sites within the Entiat basin.

C. Study area

The Entiat River Subbasin is located in north central Washington in Chelan County. The watershed is bordered by the Chelan Mountains to the northeast, Entiat Mountains to the southwest, and drains approximately 1,085 km^2. The Entiat River flows southeast and enters the Columbia River at RK 773. The system has two major tributaries: the North Fork Entiat and Mad River. The topography of the watershed is variable with semi- arid steppe characterizing the lower reaches near the confluence to temperate forests and alpine meadows at the headwaters. Upstream anadromy is currently limited to Entiat Falls, located at RK 54.4.

Study sites were randomly selected and are located at twenty-five locations throughout the Entiat and Mad River sub basins (Figure 1). Each site is visited annually.

Within the Entiat River drainage, seven study sites (snorkel survey events) are located within the lower, middle and upper reaches of the mainstem, while an additional seven are located within adjoining tributaries (Figure 1). The highest elevation site is Pyramid Creek at 5,500ft., located are RK 70.5.

In the Mad River drainage, eight study sites are located within the mainstem, while an additional 3 sites are located within tributaries (Figure 1). The highest elevation site is Jimmy Creek at 4,950 ft., located at RK 52.8.

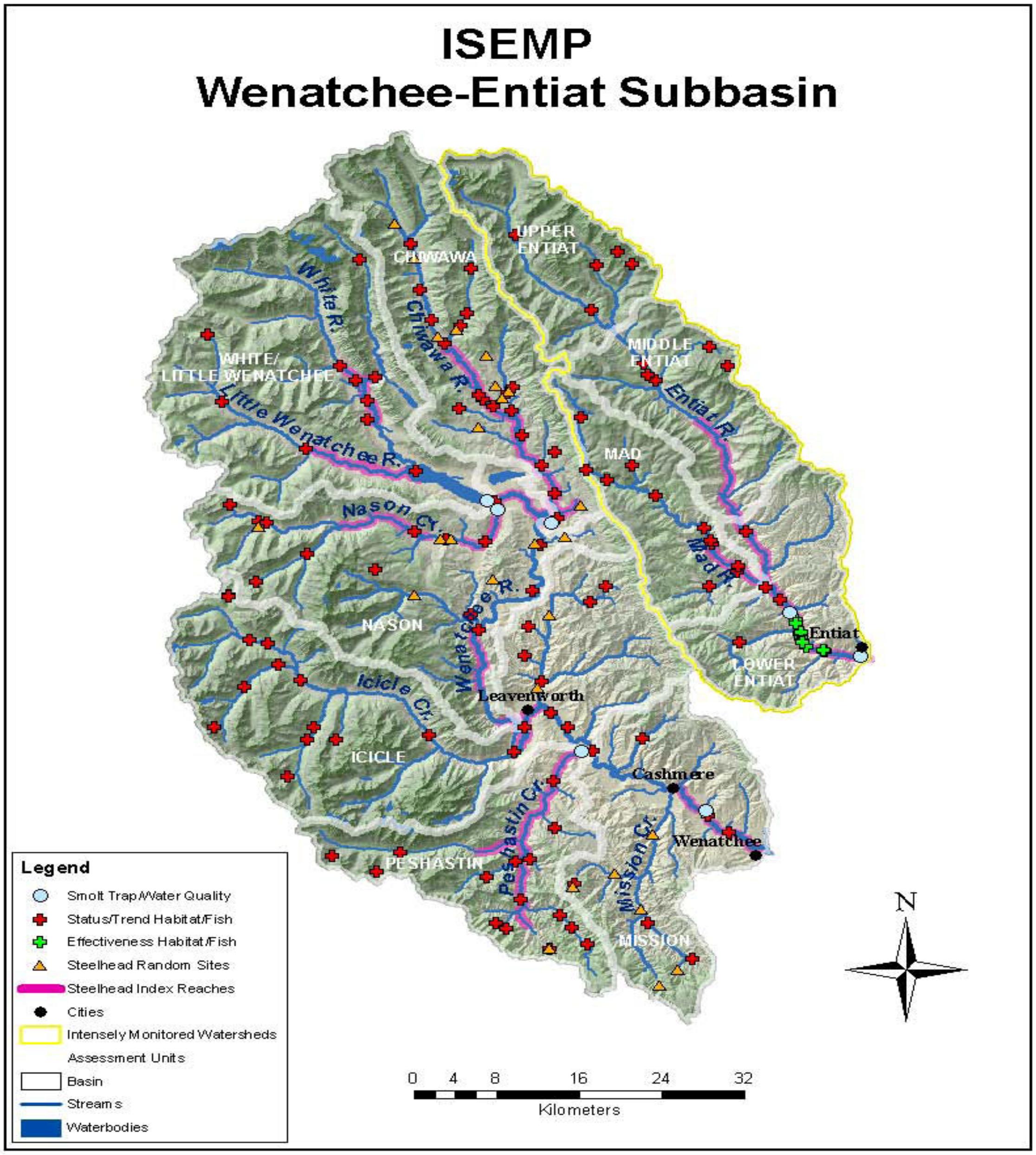

Figure 1. Detailed map of Wenatchee and Entiat Subbain with status and trend sites designated in red.

D. Methods

Fish counts were obtained using methods (Thurow 1994) outlined in the ISEMP Field Manual for the Underwater Observation Protocols of the Upper Columbia Monitoring Strategy, 2007 Draft Version.

D1. Site selection

Snorkel sites were selected by a generalized random tessellation stratified (GRTS) design. This method ensures that sites are selected without bias. Currently, a separate site selection protocol in under development and will be completed prior to the 2008 field season (Murdoch and Nelle 2007). For a complete list of 2007 snorkel sites and locations, please refer to Table 1.

D2. Snorkel surveys

Snorkel surveying began on 7/10/2007 and ended 9/13/2007. Yakama Nation (YN) staff surveyed one to three sites per day for the duration of the summer months. Multiple sites were surveyed if sufficient staff was present and ample light was available. Entiat River mainstem sites required additional staffing needs and enlisted the help of Terraqua, Inc.

As weather and river flow conditions changed during the first month of the survey period, previously scheduled snorkel events had to be rescheduled as environmental changes required. Prospective sites were discussed and agreed upon prior to survey initiation by Yakama Nation and Terraqua, Inc. staff. The communication process ensured that study sites were completed within the timeline required by ISEMP protocols.

Up to six snorkelers and at least one shore tender were used to conduct the snorkel surveys in the mainstem Entiat River snorkel sites. Off channel sites were snorkeled by one to two snorkelers depending on the site width. Mainstem Mad River sites required a minimum of three snorkelers, and tributaries in both watersheds required a minimum of two. If a bank tender was not available or needed, the reach midpoint ‘X’ was chosen as a break point to collaborate data and record results on a waterproof data sheet. Snorkelers then continued the survey until reaching point ‘K’, where the survey is concluded. Snorkel crews entered the snorkel site downstream of the site start point, labeled ‘A’ and proceeded upstream to the end of the survey area, labeled ‘K’. Snorkelers were positioned across the stream channel so as to cover the entire channel bank to bank. Shore tenders estimated fish numbers in the water too shallow to snorkel.

Snorkelers used dry suits, wet or dry gloves, felt bottom wading boots, a mask and a snorkel.

Fish species, size class and numbers are recorded on wrist cuffs made from PVC pipe. All fish observed were counted by species and assigned to size classes using odd number intervals of length (3 cm, 5 cm, 7 cm, etc.).

Water temperature was recorded at the start and end of each survey in degrees Celsius. Visibility was recorded at the start of each survey and was measured to the nearest meter using a standard, stainless steel multi-tool (Leatherman Wave).

Back at the field camp, data was transferred daily to a computer database and proofed for concurrence with field datasheets.

E. Results

Data was uploaded to NOAA/BPA in ATM format on 23 January 2008.

A total of 2325 fish were enumerated and ten species of fish were observed. We identified seven native and one introduced salmonid species in the Entiat basin: spring and summer Chinook *Oncorhynchus tschawytcha*, Coho *Oncorhynchus kisutch*, resident rainbow and steelhead *Oncorhynchus mykiss*, westslope cutthroat trout *Oncorhynchus clarki lewisi*, bull trout *Salvelinus confluentus,* mountain *whitefish Prosopium williamsoni,* and introduced brook trout *Salvelinus* fontanalis. Other species included suckers *Catastomus spp.,* sculpin *Cottus spp*, and members of the Cyprinidae family.

Steelhead/rainbow trout were present in 17 of the 25 sites; they were most numerous in the Entiat mainstem. One thousand four hundred and eighty steelhead/rainbow trout were enumerated, which accounted for 63.9% total observed fish. Cutthroat trout (O. clarki lewisi) and brook trout

(S. confluentus) were observed to be most abundant in smaller order tributaries to the Upper Entiat drainage.

Cutthroat trout were second most observed at 254 fish, or 10.9%. Greater numbers of cutthroat trout were observed at higher elevation survey sites than sites within the Entiat and Mad River mainstems.

The remaining eight species observed totaled 25.2%. Entiat River mainstem sites had the greatest abundance of fish during surveying. Adult Chinook were recorded at the Ted Stevens site (site#: WAW05541-028237) in the Entiat River.

Four sites had zero fish observed: upper and lower Pyramid Creek and upper and lower Lake Creek. Both upper and lower Pyramid Creeks are high elevation streams (1676.4m) with cool temperatures (10^{o}C). Natural migration barriers were present during summer months due to low flows. Upper and lower Lake Creeks were similar in elevation, yet cooler at 5.5^{o}C. For detailed information on observed species summations, please refer to Table 2 and Figure 3.

Entiat River discharge decreased from 750 CFS in July to 140 CFS in September. River discharge data was provided by USGS (Figure 2).

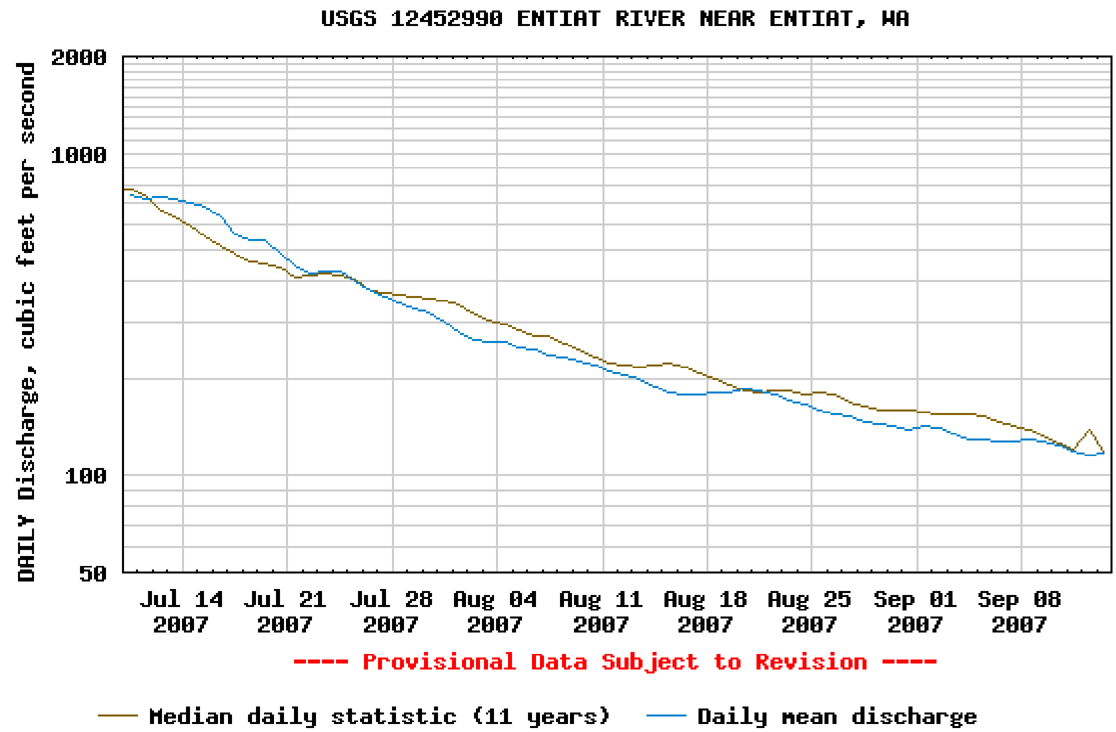

Figure 2. Entiat River Discharge, 2007. Data provided by the USGS.

Table 1. Snorkel Sites, species observed and total fish counts, 2007.

Location	Site Names	Site #	Species	N
Mad River Tributary	Tillicum Creek	CBW05583-028331-20070710	Steelhead/Rainbow, Brook Trout. Bull Trout	66
	Indian Creek	WAW05541-000277-20070710	Steelhead/Rainbow, Bull Trout,	15
	Cougar Creek	CBW05583-040619-20070717	Cutthroat Trout	34
Mad River	Upper Mad River	WAW05541-000853-20070716	Steelhead/Rainbow, Cutthroat Trout	50
	Upper Mad River	CBW05583-043691-20070717	Steelhead/Rainbow	45
	Mad River below Burg	CBW05583-000427-20070718	Steelhead/Rainbow, Cutthroat Trout, Bull Trout	58
	Maverick Saddle	WAW05541-003861-20070718	Steelhead/Rainbow, Cutthroat Trout, Bull Trout	45
	Mad River below Pine Flats	CBW5583-061099-20070719	Steelhead/Rainbow, Bull Trout, Chinook	83
	Mad River at Switchback	WAW05541-006677-20070720	Steelhead/Rainbow, Cutthroat Trout	162
	2nd Mad River above Pine Flats	CBW05583-069291-20070720	Steelhead/Rainbow, Cutthroat Trout	61
	1st Mad River above Pine Flats	CBW05583-036523-20070720	Steelhead/Rainbow, Cutthroat Trout	117
Entiat River Tributary	Roaring Fork	WAW05541-000589-20070721	Steelhead/Rainbow	6
	Upper Pyramid	WAW05541-015253-20070725	None	0
	Lower Pyramid	WAW05541-016469-20070725	None	0
	Upper Lake Creek	CBW00583-013739	None	0
	Lower Lake Creek	CBW00583-003499	None	0
	Snowbrushy	CBW00583-014139	Brook Trout	17
	North Fork	WAW05541-006037-20070725	Cutthroat Trout	94
Entiat River	Ardenvior Reach	CBW05583-020139-20070724	Steelhead/Rainbow, Bull Trout, Chinook, Whitefish, Sucker sp., Sculpin, Coho Salmon	240
	Spruce Grove	CBW05583-11691-20070724	Steelhead/Rainbow, Cutthroat Trout, Brook Trout, Chinook salmon.	106
	Box Canyon	WAW05541-013077	Steelhead/Rainbow Cutthroat Trout, Bull Trout, Chinook salmon, Whitefish	301
	Upper Box Canyon	CBW05583-023211	Steelhead/Rainbow, Brook Trout, Bull Trout, Sucker sp.	261
	Ted Stevens	WAW05541-028237	Steelhead/Rainbow, Cutthroat Trout, Chinook Salmon, Whitefish, misc. Cyprinid fry.	272
	Grant Roundy	CBW05583-003755	Steelhead/Rainbow, Chinook salmon, Whitefish, Sucker sp.	42
	Silver Falls	CBW05583-055979	Steelhead/Rainbow, Brook Trout, Bull Trout, Sucker sp.	255

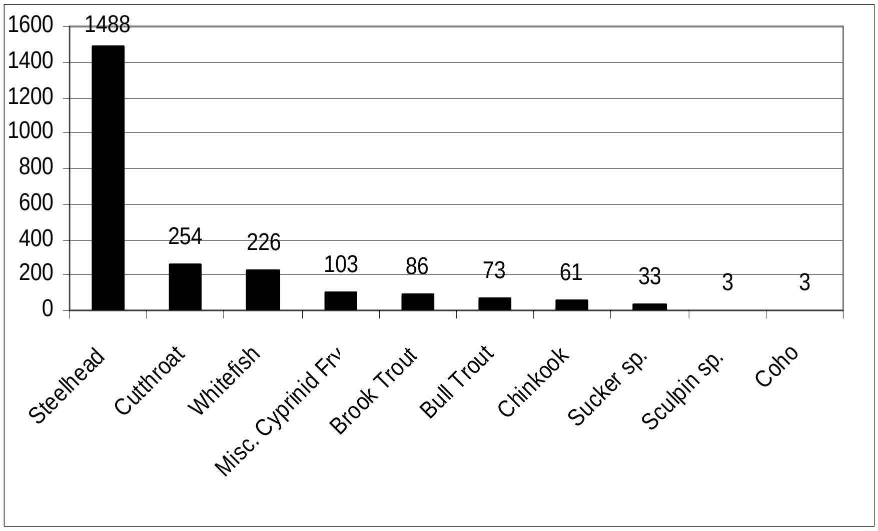

Figure 3. Summary of fish counts by species, 2007

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F. Discussion

Analysis of data and interpretation of results are beyond the scope of this report and contract. These data will be included in the ISEMP 5-year analysis.

Fish were observed at all sites except those on Pyramid Creek and Lake Creek, both headwater tributaries to the Entiat River. Found in most sites, rainbow trout and/or steelhead *Oncorhynchus mykiss* were by far the most numerous and widely distributed species observed. We speculate that headwater streams may support resident life histories while mainstem locations may produce anadromous life histories. However the extent of resident vs. anadromous life-histories and the amount of overlap and gene-flow between the two cannot be established through this research. Assessing the genetic and/or demographic contribution of resident red-band rainbow trout to upper Columbia River anadromous steelhead is a regionally recognized data gap (UCSRB 2007), and may be critical to our understanding abundance and productivity for steelhead in the Entiat River.

Chinook salmon were only observed in five of seven mainstem Entiat River sites and were not observed in any other locations. Coho salmon were observed at one mainstem Entiat River site (Ardenvoir reach) and are likely the result of strays from reintroduction efforts in the Wenatchee and Methow rivers.

Brook and Bull trout were common throughout the basin. In areas where both species occur concurrently the potential for hybridization exists, which potentially may complicate correct identification during surveys. Future snorkeling crews should pay special attention when identifying these two species in the upper watershed.

F.1 Logistical Considerations

Snorkeling activities were conducted and completed without any major problems. Most of the difficulties we encountered were a function of access, discharge and remote site location. Access to many sites was complicated by lengthy sections of unmaintained trail systems or, in some cases, no trail at all. Trail systems along the Mad River were inundated with fallen trees and other debris that occurred during the Tyee fire in 1994, excluding the use of horse packers or outfitters to transport equipment and gear to remote sites. All equipment was transported by backpack. We expect that navigation in and around these areas will continue to require allocation of sufficient time to access sites due to the intensity and expansiveness of the fire damage.

Locating sites often took a substantial amount of time; Heavy canopy cover resulted in weak GPS signals, or erroneous locations. We recommend that both habitat crews and snorkel crews standardize the type of GPS unit used, selecting units with increased antennal strength and precision.

Due to the remote and sometimes hazardous conditions (i.e. numerous rattlesnakes at Roaring Fork Creek and steep off trail travel to access Cougar Creek), we recommend that the project acquire satellite telephones as a safety precaution.

G. Literature Cited

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CHAPTER 2: ROTARY SMOLT TRAP OPERATION IN NASON CREEK, 2007

ABSTRACT

This report summarizes juvenile coho salmon, spring Chinook salmon, and steelhead migration data collected in Nason Creek during 2007; providing abundance and freshwater productivity estimates. We used species enumeration at the trap and efficiency trials to describe emigration timing and to estimate the number of emigrants. Trapping began on March 1, 2007 and was suspended on December 1, 2007 when snow and ice accumulation prevented operation.

During 2007, 44 brood year (BY) 2005 coho, 1 BY 2006 coho, 691 BY 2005 spring Chinook salmon, 103 BY06 Chinook fry, 626 BY06 subyearling Chinook, 117 steelhead smolts, 53 steelhead fry and 1488 steelhead parr were trapped.

Mark-recapture trap efficiency trials were performed over a range of stream discharge stages. A total of 1071 spring Chinook and 1312 steelhead were implanted with Passive Integrated Transponder (PIT) tags. Most PIT tagged fish were used for trap efficiency trials. We were unable to identify a statically significant relationship between stream discharge and trap efficiency; We used pooled efficiency estimates, specific to species and trap position to estimate the number of fish emigrating past the trap. We estimate that 557 BY05 coho, 5 BY06 coho, 7893 BY05 Chinook, 5294 BY06 Chinook, and 25,108 steelhead parr and smolts emigrated from Nason Creek in 2007.

A. Introduction

Beginning in the fall of 2004, the Integrated Status & Effectiveness Monitoring Program (ISEMP, BPA project #2003-017-000), began sharing the cost of operating a rotary smolt trap in Nason Creek, with the mid-Columbia Coho Reintroduction Feasibility Study (BPA project #1996-040-00). This cost-share extended previous trap operations from three months per year to nine months per year. In 2007 Grant County Public Utility District (GCPUD) also began funding this ongoing study.

The data generated from this project will be used to calculate annual population estimates, egg-to-emigrant survival, and emigrant-to-adult survival rates. Combined with other monitoring and evaluation (M&E) data, population estimates may be used to evaluate the effects of supplementation programs in the Wenatchee River Basin as well as provide data to develop a spawner-recruit relationship in Nason Creek. Tissue samples are collected from Chinook and bull trout captured in the trap to supply DNA for ongoing studies in the basin. Passive integrated transponder (PIT) tags are implanted into juvenile naturally produced Chinook and steelhead under the ISEMP program to determine if smolt traps in collaboration with other monitoring activities can provide the necessary data to resolve uncertainties regarding life history, growth, an survival in the Wenatchee Basin (Murdoch et al. 2005)

The work captured in this report is one component of three monitoring programs (ISEMP, GCPUD, and YN's mid-Columbia coho reintroduction project), and while it stands alone as an important contribution to the management of anadromous salmonids and their habitat, it also plays a key role within each of these monitoring programs. Each component of work within ISEMP is reported on individually, as is done so here, and in annual and triennial summary reports that present all of the overall project components in their programmatic context and shows how the data and tools developed can be applied to the development of regionally consistent, efficient and effective Research, Monitoring and Evaluation.

This document reports data collected from the Nason Creek smolt trap between March 1 and December 1 , 2007. Data collected during fall of 2006 is presented with the spring 2007 data to produce a complete population estimate for the BY 2005 spring Chinook salmon and an estimate of egg-to-emigrant survival. Emigration estimates are also provided for steelhead and coho salmon.

B. Purpose of this project

The objectives of this project are to:

1) Estimate the juvenile production and productivity of spring Chinook , steelhead (BPA #2007-017-00, and GCPUD), and coho salmon (BPA #1996-040-00) in Nason Creek.

2) Describe the temporal variability of spring Chinook, steelhead (BPA # 2003-017-00, GCPUD) and coho salmon (BPA #1996-040-00) emigrating from Nason Creek.

C. Study Area

The Nason Creek watershed drains 65,600 acres of alpine glaciated landscape where high precipitation and moderate rain on snow recurrence control the hydrology and aquatic communities (USFS et al. 1996). Nason Creek originates near the Cascade crest at Stevens Pass and flows approximately 37 river kilometers (RK) until joining the Wenatchee River at RK 86.3 just below Lake Wenatchee. The smolt trap is located below the majority of spring Chinook and steelhead spawning grounds at RK 0.8 (Figure 1). There are 26.4 mainstem RKs accessible to anadromous fish in Nason Creek. Private land ownership comprises 52,300 acres (79.7%) of the watershed while 12,800 acres (19.5%) are federal and 480 acres (0.1%) are state owned (USFS et al. 1996).

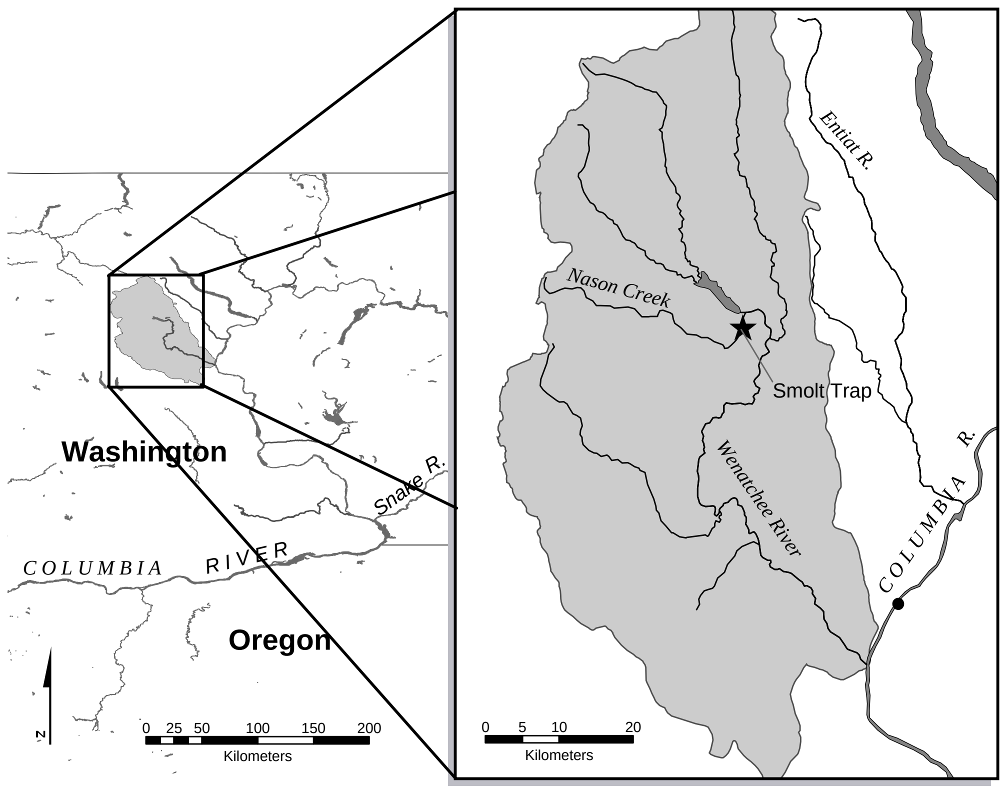

Figure 4. Nason Creek Smolt trap location.

The channel morphology of the lower 25 kilometers of Nason Creek has been impacted by development of highways, railroads, power lines, and residential development resulting in channel confinement and reduced side-channel habitat. The present condition is a low gradient (<= 1.1%), low sinuosity (1.2 to 2.0 channel length to valley length ratio), and mainly depositional channel (USFS et al. 1996).

The Washington State Department of Ecology (DOE) began operating a stream monitoring station at RK 1.0 of Nason Creek in May of 2002. The mean daily discharge during the 2007 trapping season (March 1, 2007 through December 1, 2007) was 450 cfs (Figure 2 and Appendix A). The discharge data provided by DOE should be considered provisional. Peak runoff typically occurs in May and June with occasional high water produced by rain on snow events in October and November.

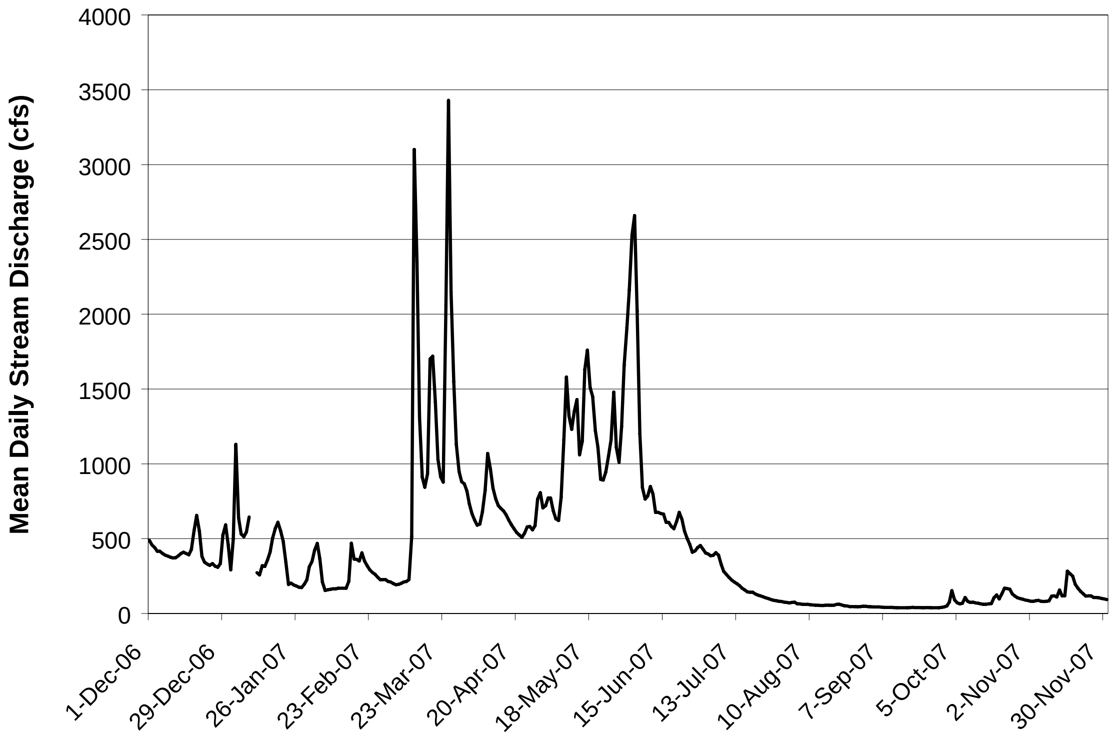

Figure 5. Mean daily stream discharge at the Nason Creek DOE stream monitoring station, RK 1, December 1, 2006 through December 1, 2007.

During the months we operated the trap, the mean daily water temperatures recorded at the DOE monitoring station ranged from a low of 0.04 °C to a high of 16.6°C (Figure 3). Daily mean stream temperature measurements taken by the Washington State DOE during water years 2007 and 2008 are provided in Appendix A. Water temperature data provided by DOE should be considered provisional.

The maximum safe fish handling temperature (as defined in Section 10 Permit # 1493) is 21° C. Fish were handled in the morning when temperatures were at a minimum. The water temperatures did not reach 21° C in 2007 (Figure 3).

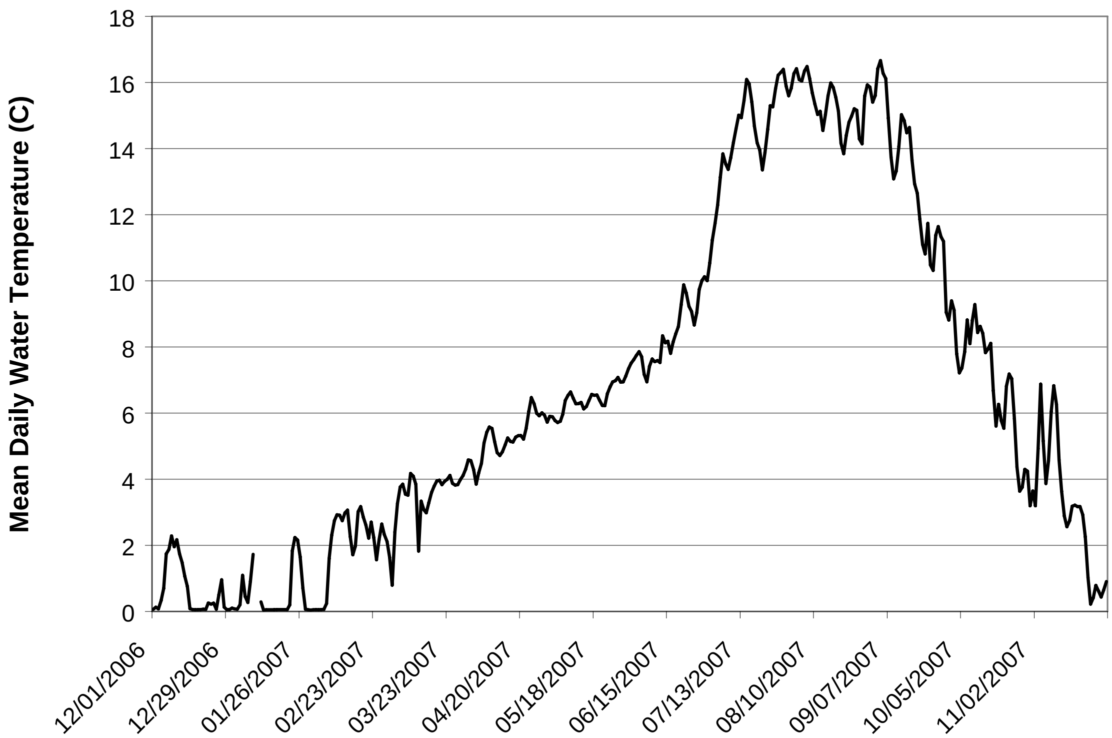

Figure 6. Mean daily water temperature at the Nason Creek DOE stream monitoring station, RK 1, December 1, 2006 through December 1, 2007.

D. Methods

D.1 Trapping Equipment and Operation

A floating rotary smolt trap with a 5-foot diameter cone, manufactured by EG Solutions of Eugene, OR, was used to capture fish moving downstream. The trap retains live fish in a holding box until they are removed. A rotating drum screen constantly removes small debris from the live box. The trap was suspended with wire rope from a snatch block connected to a stream spanning cable and was positioned laterally in the thalweg with a 'come-along' type puller. We used two main trap positions during 2007; a 'back' position during high water (~150 to 1750 cfs) in the spring and 'forward' position located 10 meters upstream during low water (~ 40 to 150 cfs) in the summer/fall. When discharge exceeded 1000 cfs we positioned the trap half-way between the streambank and thalweg. Stream discharge lower than 40 cfs necessitated raising the cone slightly to avoid touching the streambed. Trap operating positions and discharge range can be found in Table 1.

Table 2. Nason Creek smolt trap operating positions and generalized discharge range.

Trap Position	CFS Range	2007 Operational Dates
Back	150 to 1750	March 1 – July 17; October 3 – December 1
Forward	40 to 150	July 18 – October 2
Pulled	> 1750	March 13-14; March 25; June 3-6

D.2 Biological Sampling

Trap operating procedures and techniques followed a standardized basin-wide monitoring plan developed by the Upper Columbia Regional Technical Team (RTT) for the Upper Columbia Salmon Recovery Board (UCSRB; Hillman 2004), which was adapted from Murdoch et al. (2000).

All fish were enumerated by species and size class. Fish to be sampled were anesthetized in a solution of MS-222, weighed with a portable electronic scale, and measured in a trough type measuring board. Scale samples were collected from steelhead measuring ≥ 100 mm FL to facilitate assigning these fish to age-classes and brood years. The scale samples were provided to WDFW for analysis. Anesthetized fish received oxygen through a portable aquarium bubbler and were allowed to fully recover before being released downstream from the trap.

Length and weight were recorded for all fish except on days when large numbers of a single species were collected, and then a sub-sample 25 of each species and size/age class) were measured and weighed. Fork length (FL) was recorded to the nearest millimeter and weight to the nearest 0.1 gram. We used these data to calculate a Fulton-type condition factor (Kfactor) using the formula:

$$K = (W/L^3) \times 100{,}000$$

Where K = Fulton-type condition metric, W = weight in grams, L = fork length in millimeters and 100,000 is a scaling constant.

During periods when the trap was not operating (e.g. high discharge, high debris, mechanical problems) the number of target species captured was estimated. The estimated number of fish captured was calculated using the average number of fish captured two days prior and two days after the break in operation.

D.3 Mark-Recapture Trials

Groups of marked salmonids were used for trap efficiency trials. Marked groups of fish were released over the greatest range of discharge possible in order to increase the efficacy of the efficiency-discharge regression model used to estimate the daily trap efficiency (See '**data analysis**'). Mark-recaptured trials followed the protocol described in Hillman (2004). The protocol suggests a minimum sample size of 100 fish for each mark-recapture trial. Due to the limited number of fish caught in the trap, mark-recapture trials were often completed with smaller sample sizes.

We typically combined the catch over a maximum of 3 days to provide the largest mark group possible within ESA section 10 permit limitations (#1493). Fish being held for mark-recapture trials were kept in auxiliary live boxes attached to the end of each pontoon. Mark groups were released regardless of sample size but only those groups counting ≥25 fish of a single size class and species were used in the linear regression model (See '**Emigration Estimate and Expansion of Daily Catch'**). Mark groups consisting of less than 25 fish were used to support a pooled estimate if needed.

D.3.1 Marking and PIT tagging

Fish used in efficiency trials were marked with an upper or lower caudal fin clip, a PIT tag, or both. PIT tags were only included as a mark for naturally produced spring Chinook and steelhead measuring 60 mm FL and greater. Fin clips were used for efficiency trials with hatchery coho salmon. Fin clips of naturally produced spring Chinook and steelhead were retained for genetics research and reproductive success evaluation being conducted be WDFW and NMFS.

Fish to be PIT tagged were handled as described above (See '**Biological Sampling'**). Once anesthetized, each fish was examined for any wounds or descaling and then scanned for the presence of a previously implanted PIT tag. A 12mm Digital Angel 134.2 kHz type TX 1411ST PIT tag was inserted into the body cavity using a 12-gauge hypodermic needle. To prevent disease transmission, each hypodermic needle was soaked in ethyl alcohol for approximately 10 minutes prior to use and re-use. Each unique tag code was recorded along with date of tag implantation, date of fish release, tagging personnel, fork length, weight, and water temperature. These data were entered into a data base and submitted to the PIT Tag Information System (PTAGIS). PIT tagging methods were consistent with methodology described in the PIT Tag Marking Procedures Manual (CBFWA 1999).

After marking and/or PIT tagging, fish were transported in 5-gallon buckets 1.4 km upstream to the release site. At the release site the marked and/or PIT tagged fish were held for a minimum of 24-hours in a large (1.0 m^2) live box to ensure complete recovery, assess tagging mortality and to recover any shed tags.

Marked fish were released directly from the live box at sunset. The live box was located on the right bank which was accessible by vehicle. The left bank is not accessible, and we were unable to cross the creek at higher flows. During 2004 we compared marked groups released from the right bank, stream center, and both banks and found no difference in the recovery rate (Prevatte and Murdoch 2004); We are confident that the stream hydraulics between the release site and the smolt trap facilitate adequate fish dispersal when released exclusively from the right bank.

D.4 Data Analysis

D.4.1 Trap Efficiency

Trap efficiency was calculated with the following formula:

$$\text{Trap efficiency} = E_i = R_i / M_i$$

Where E_i is the trap efficiency during time period i; M_i is the number of marked fish released during time period i; and R_i is the number of marked fish recaptured during time period i.

D.4.1.1 Emigration Estimate and Expansion of Daily Catch

The daily emigration estimate was calculated by expanding the catch at the trap by trap efficiency using the following formula:

$$\text{Estimated daily migration} = \hat{N}_i = C_i / \hat{e}_i$$

Where N_i is the estimated number of fish passing the trap during time period i; C_i is the number of unmarked fish captured during time period *i;* and e_i is the estimated trap efficiency for time period i.

A linear regression was used to correlate trap efficiency from individual efficiency trials (dependant variable) with discharge (cfs; independent variable). If the results of the regression were significant (p<0.05; r^2 >0.50) the regression equation was used to estimate daily trap efficiency. Mark-recapture data from years 2005 through 2007 was used in the analysis.

The variance for the total daily number of fish traveling downstream past the trap was calculated form the following formulas:

$$\text{Variance of daily migration estimate} = \operatorname{var}\left[\hat{N}_i\right] = \hat{N}_i^2 \frac{\text{MSE}\left(1 + \frac{1}{n} + \frac{\left(X_i - \overline{X}\right)^2}{\left(n-1\right)s_X^2}\right)}{\hat{e}_i^2}$$

Where X_i is the discharge for time period i, and n is the sample size.

If a relationship between discharge and trap efficiency was not present (i.e., p >0.05; r^2 < 0.5), a pooled trap efficiency was used to estimate daily emigration. Only data from 2007, stratified by species and trap position was used in the analysis.

$$\text{Pooled trap efficiency} = E_p = \sum R / \sum M$$

The variance for daily emigration estimates using the pooled trap efficiency was calculated using the formula:

$$\text{Variance for daily emigration estimate} = \operatorname{var}\left[\hat{N}_i\right] = \hat{N}_i^2 \frac{E_p(1 - E_p) \big/ \sum M}{E_p^2}$$

The total emigration estimate and confidence interval were calculated using the following formulas:

$$\text{Total emigration estimate} = \sum \hat{N}_i$$

$$\text{95\% confidence interval} = 1.96 \times \sqrt{\sum \operatorname{var}\left[\hat{N}_i\right]}$$

The following assumptions must be made for the population estimated to be valid (Everhart and Youngs 1953):

1) All marked fish passed the trap or were recaptures during time period *i*.
2) The probability of capturing a marked or unmarked fish is equal.
3) All marked fish recaptured were identified.

E. Results

E.1 Dates of Operation

We deployed the trap and began operating on March 1. We fished the trap continuously 24 hours a day 7 days per week, except during periods of extreme high flows or large hatchery smolt releases upstream of the trap (Table 2). Detailed documentation of operating dates can be found in Appendix B.

Table 3. Nason Creek smolt trap operating days, 2007.

Trap Status	Description	Days Operating	Days Not Operating
Operating	Continuous	253	
Interrupted	Stopped by Debris		9
Not Operating	High Flow		7
Not Operating/ Interrupted	Low Flow		5
Not Operating/ Interrupted	Hatchery Release		4
	Total Days	**251 (90.9%)**	**25 (9.1%)**

E.2 Emigration Timing

E.2.1 Coho Yearlings (BY 2005)

We collected 44 yearling coho during 2007. The first coho was trapped on March 12. Peak catch (49%) occurred between March 12 and April 2 (Figure 4). The trap did not cause any mortality to yearling coho. Mean fork length (mm), weight (g), and K-factor can be found in Table 3.

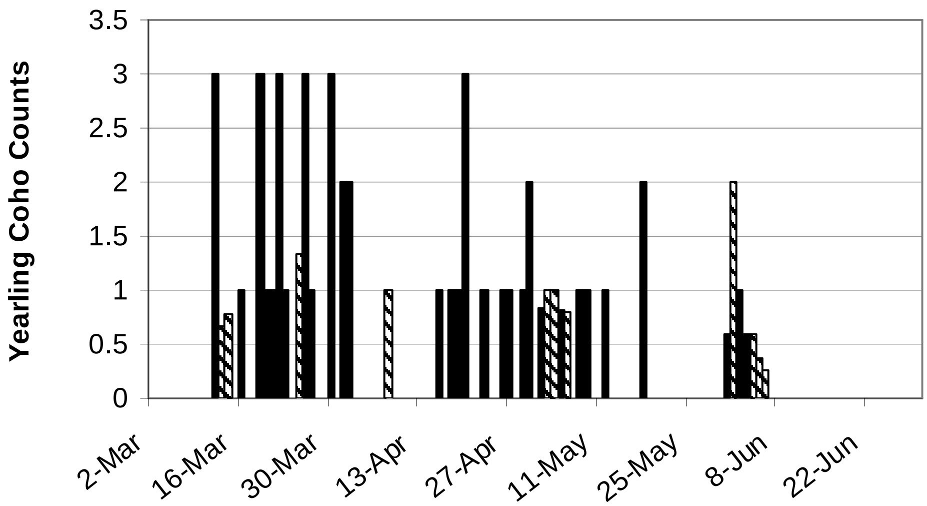

Figure 7. Coho yearling counts (black bars), run timing, and estimated catch (striped bars) for days not trapping at the Nason Creek smolt trap, March 2 through June 30, 2007.

Table 4. Summary of length and weight sampling conducted on BY05 and BY06 wild coho captured at the Nason Creek smolt trap in 2007.

Brood	Stage	Fork length (mm)			Weight (g)			K-
		Mean	N	SD	Mean	N	SD	factor
2005	Smolt	92.9	36	12.5	8.7	36	4.0	1.03
2006	Parr	83.0	1	n/a	6.2	1	n/a	1.08

E.2.2 Coho Subyearlings (BY 2006)

We collected one subyearling coho on October 8, 2007. The trap did not cause any mortality to subyearling coho. Fork length (mm), weight (g), and K-factor can be found in Table 3.

E.2.3 Spring Chinook Yearlings (BY 2005)

We collected 691 BY 2005 yearling spring Chinook smolts during 2007. The first smolt was trapped on March 2, the first night of operation. Peak catch occurred on March 19 with 91 yearlings (Figure 5). Nine Chinook yearling mortalities were found in the trap (see '**3.6 ESA Compliance'**). Fork Length (mm), weight (g), and K-factor at the time of migration can be found in Table 4.

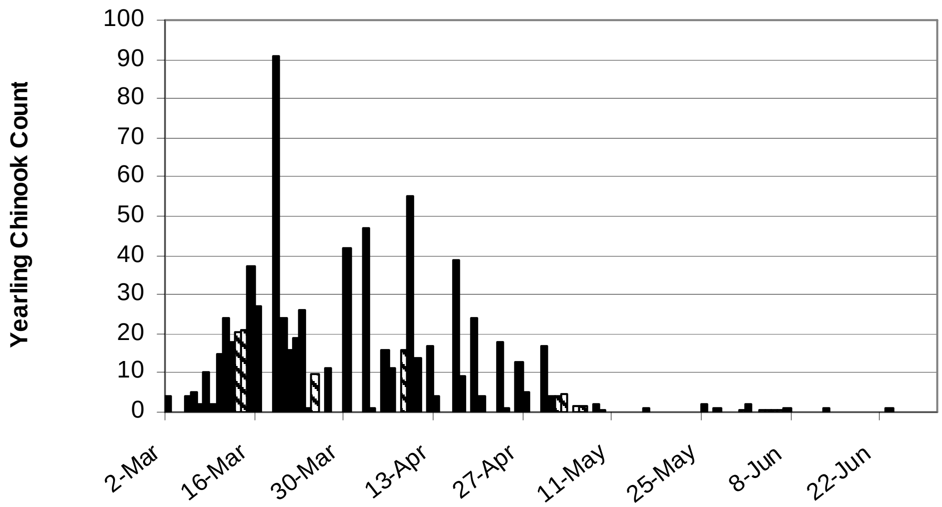

Figure 8. Yearling spring Chinook smolt counts (black bars), run timing, and estimated catch (striped bars), for days not trapping at the Nason Creek smolt trap, March 1 through June 30, 2007.

Table 5. Summary of length and weight sampling conducted on BY05 and BY06 Chinook captured at the Nason Creek smolt trap in 2007.

Brood	Stage	Fork length (mm)			Weight (g)			K-factor
		Mean	N	SD	Mean	N	SD	
2005	Smolt	89.0	676	8.2	8.0	675	6.1	1.12
2006	Parr	79.5	686	13.8	6.1	685	2.6	1.14

E.2.4 Spring Chinook Fry (BY2006)

We collected 103 BY 2006 spring Chinook fry during 2006. The first fry was trapped on March 10 (Figure 6). Spring Chinook fry continued to be trapped through mid-June. Spring chinook fry were not included in population estimates. After July 1, BY2006 spring Chinook were considered sub-yearling parr. One spring Chinook fry mortality occurred on April 24 (see '**3.6 ESA compliance**').

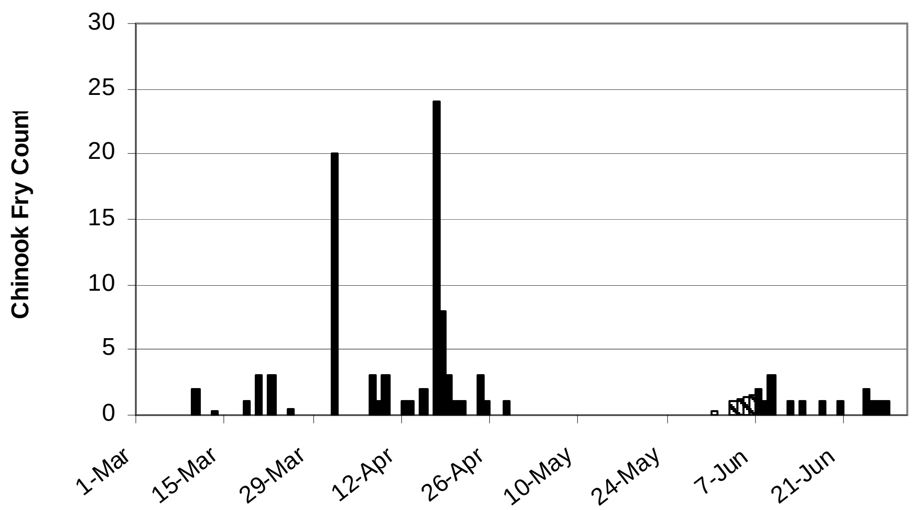

Figure 9. Spring Chinook fry counts (black bars), run-timing, and estimated catch (striped bars) for days not trapping at the Nason Creek smolt trap, March 1 through June 30, 2007.

E.2.5 Spring Chinook Subyearling (BY 2006)

We collected 626 BY 2006 subyearling spring Chinook between July 1 and December 1, 2007. Peak catch (64%) occurred during fall months; October 20 through December 1 (Figure 7). One subyearling Chinook mortality occurred on October 28 (see '**3.6 ESA compliance**'). Fork Length (mm), weight (g), and K-factor at the time of migration can be found in Table 4.

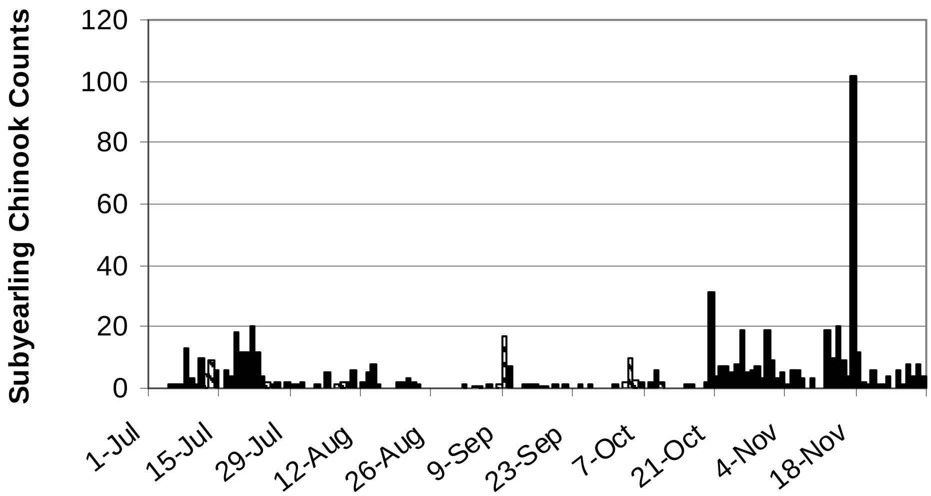

Figure 10. Subyearling spring Chinook counts (black bars), run-timing, and estimated catch (striped bars) for days not trapping at the Nason Creek smolt trap, June 25 through December 1, 2007.

E.2.6 Steelhead/Rainbow Trout Smolts

We collected 117 steelhead smolts and transitional smolts during 2007. The first smolt was trapped on March 16. Smolts and transitional smolts were captured regularly through early May (Figure 8). No steelhead smolts were captured after June 12. No steelhead smolt mortalities occurred due to trapping. Additionally, 2,717 hatchery steelhead smolts were captured between March 15 and October 4. At the time of this draft, length-at-age data from scale analysis was not yet available. Table 5 provides the mean length and K-factor for emigrating steelhead. This report will be revised when scale/age data becomes available.

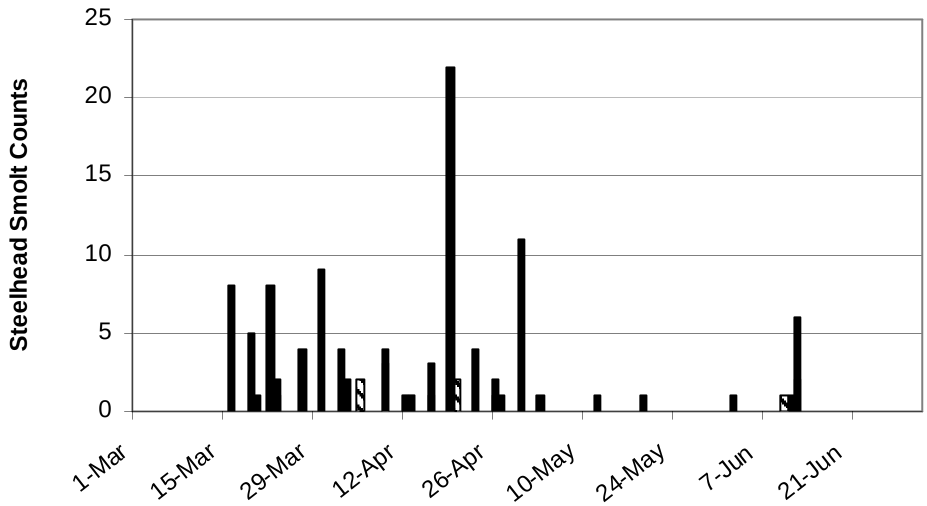

Figure 11. Steelhead smolt counts (black bars), run-timing, and estimated catch (striped bars) for days not trapping at the Nason Creek smolt trap, March 1 through June 30, 2007.

Table 6. Summary of length and weight sampling conducted on multiple year class steelhead smolts and parr at the Nason Creek smolt trap in 2007.

Brood[1]	Stage	Fork length (mm)			Weight (g)			K-
		Mean	N	SD	Mean	N	SD	factor
N/A	Smolt	121.9	120	37.5	23.0	120	15.8	1.01
N/A	Parr	80.2	1173	16.1	6.3	1171	5.4	1.07

[1]Year-class size data is pending scale analysis

E.2.7 Steelhead/Rainbow Trout Fry

We collected 186 BY 2007 steelhead/rainbow trout fry during 2007. The first fry was trapped on July 12. Peak catch (75%) occurred between August 10 and August 30 (Figure 9). Five steelhead fry mortalities were found in the trap (see '**3.6 ESA Compliance**').

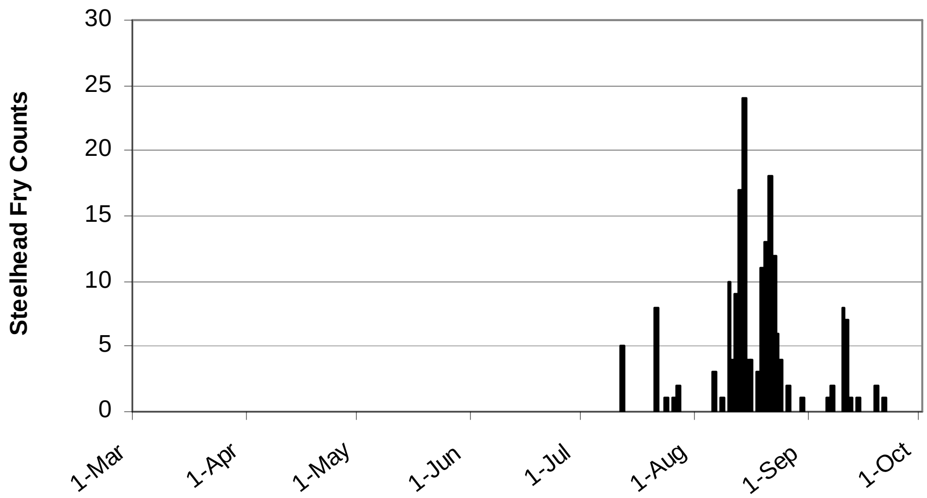

Figure 12. Steelhead/rainbow trout fry counts, run-timing, and estimated catch for days not trapping at the Nason Creek smolt trap from March 1 through October 1, 2007.

E.2.8 Steelhead/Rainbow Trout Parr

We collected 1488 steelhead parr from multiple age classes during 2007. The first parr was trapped on March 2, with a bimodal distribution of peak emigration occurring from March to April and again in June. Steelhead parr continued to be trapped until the last day of operation on December 1. Three steelhead parr mortalities were found in the trap (see **'3.6 ESA compliance'**). Table 5 provides the mean length and K-factor for emigrating steelhead.

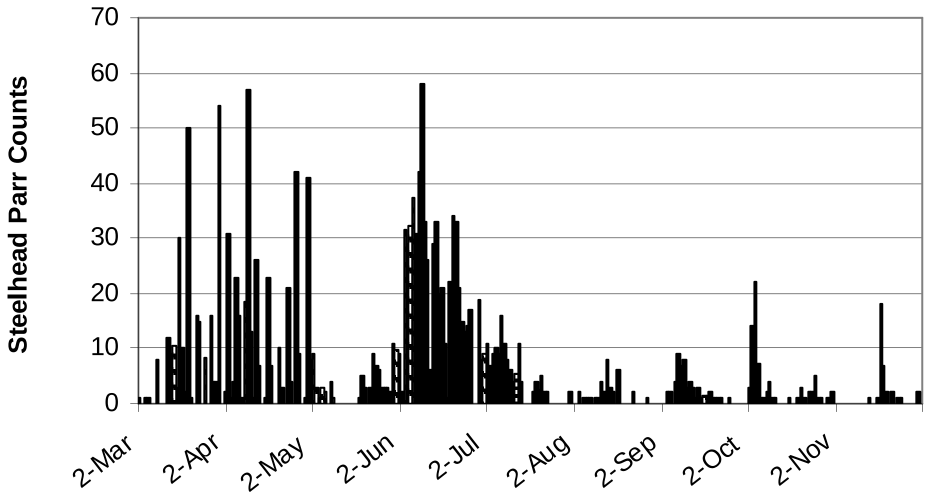

Figure 13. Steelhead parr counts (black bars), run-timing, and estimated catch (striped bars) for days not trapping at the Nason Creek smolt trap, March 1 through December 1, 2007.

E.3 Trap Efficiency Calibration and Population Estimates

E.3.1 Coho Yearlings (BY 2005)

No mark group releases were performed with yearling coho due to insufficient numbers collected at the trap. Spring Chinook yearlings were used as surrogates for trap efficiency for the following population estimate. A pooled trap efficiency of 9.81% (Table 7) was used to estimate yearling coho (smolt) production in Nason Creek. We estimate that 557 (± 26 95% CI) yearling BY05 coho emigrated from Nason Creek (Table 6). During 2006 we estimated that 88 (± 3 95% CI) subyearling coho emigrated from Nason Creek resulting in a total population estimate of 645 emigrants (Table 6).

Table 7. Estimated egg-to-emigrant survival and smolts per redd for Nason Creek coho. Emigrant-per-redd values were not calculated for incomplete brood years.

Brood Year	Number of Redds	Estimated number of Eggs[a]	Number of Emigrants			Egg-to-Emigrant (%)	Emigrants per redd
			Age-0[b]	Age-1	Total		
2003	6	12543	0	120	120	0.96%	20
2004	35	107,940	224	431	655	0.61%	18.7
2005	41	117,547	88	557	645	0.55%	15.7
2006	4	12,504	5		5	--	--

[a] Mean annual fecundity based on hatchery egg counts was used to estimate the number of eggs.
[b] Estimate is based on capture of summer/fall parr and does not include captures of fry prior to July 1.

E.3.2 Spring Chinook Yearlings (BY 2005)

We completed 25 marked group releases for yearling Chinook smolts in 2007. Of these releases six had sample sizes greater than 25 and were included in the linear regression analysis (Table 7). Releases in 2007 were combined with previously collected mark recapture data to increase the sample size and statistical power. The results of the linear regression was not significant (p=0.45, r^2=0.03). A pooled trap efficiency of 9.8% (Table 7) was used to estimate yearling spring Chinook (smolt) production in Nason Creek. We estimate that 7,893 (± 422 95% CI) yearling spring Chinook emigrated from Nason Creek from March 1 through June 23 (Table 8). During 2006 we estimated that 24,348 (32,241 ± 410 95% CI) subyearling spring Chinook emigrated from Nason Creek (Table 8).

Table 8. Mark/recapture efficiency trials used to estimate emigration of BY05 spring Chinook in Nason Creek. All releases were used for a pooled estimate; only releases with >25 fish were used in the regression analysis. (YC = yearling Chinook)

Species	Date	Trap Position	Number Released	Number Recaptured	Efficiency (%)	Discharge (m^3/s)
YC	3 March	BACK	4	1	25.0	210
YC	6 March	BACK	4	2	50.0	194
YC	17 March	BACK	64	7	10.9	933
YC	20 March	BACK	91	13	14.3	1410
YC	23 March	BACK	59	7	11.9	878
YC	26 March	BACK	12	0	0.0	2150
YC	31 March	BACK	40	2	5.0	866
YC	3 April	BACK	46	1	2.2	666
YC	6 April	BACK	16	0	0.0	598
YC	10 April	BACK	53	4	7.5	965
YC	13 April	BACK	17	1	5.9	721
YC	16 April	BACK	36	3	8.3	660
YC	20 April	BACK	23	8	34.8	541
YC	23 April	BACK	18	1	5.5	536
YC	27 April	BACK	13	1	7.7	586
YC	1 May	BACK	16	1	6.3	720
YC	8 May	BACK	2	0	0.0	1160
YC	25 May	BACK	2	0	0.0	1050
YC	27 May	BACK	1	0	0.0	1480
YC	1 June	BACK	1	0	0.0	1910
YC	9 June	BACK	3	0	0.0	785
YC	12 June	BACK	1	0	0.0	676
YC	13 June	BACK	1	0	0.0	675

Table 9. Estimated egg-to-emigrant survival and smolts per redd for Nason Creek spring Chinook. Emigrant-per-redd values were not calculated for incomplete brood years.

Brood	Number	Estimated	Number of Emigrants	Egg-to-	Emigrants

Year	of Redds	number of Eggs[a]	Age-0[b]	Age-1	Total	Emigrant (%)	per redd
2002	294	1,477,056	DNOT[c]	9084	9084	--	--
2003	111	484,515	7,899	2,096	9995	2.06%	90
2004	159	770,514	12,569	3267	15,836	2.05%	100
2005	186	811,890	24,348	7,893	32,241	4.0%	173
2006	152	726,256	5295			--	--

[a] Mean annual fecundity based on Chiwawa River hatchery egg counts from wild broodstock to estimate the number of eggs.
[b] Estimate is based on capture of summer/fall parr and does not include captures of fry prior to July
[c] Data not collected

E.3.3 Spring Chinook Subyearlings (BY 2006)

We completed 29 marked group releases for subyearling Chinook in 2007. Of these releases 4 had sample sizes greater than 25 and were included in the linear regression analysis (Appendix E). Releases in 2006 were combined with 11 releases in 2005 to increase the sample size and statistical power. The result of the regression analysis was not significant ($p = 0.45$; $r^2 = 0.02$). A pooled trap efficiency of 18.7% ('back' trap position) and 6.1% ('upper' trap position; Table 9) was used to estimate the production of subyearling Chinook (BY 2006) in Nason Creek. We estimate that 5295 (± 930 95% CI) subyearling spring Chinook emigrated from Nason Creek in 2007.

Table 10. Mark/recapture efficiency trials used to estimate emigration of BY06 subyearling spring Chinook in Nason Creek. All releases were used for a pooled estimate; only releases with >25 fish were used in the regression analysis. (SBC= subyearling Chinook).

Species	Date	Trap Position	Number Released	Number Recaptured	Efficiency (%)	Discharge (m^3/s)
SBC	20 Aug	UPPER	4	0	0.00	60.2
SBC	23 Aug	UPPER	6	0	0.0	51.8
SBC	10 Sept	UPPER	18	2	11.1	39.8
SBC	17 Sept	UPPER	1	0	0.0	39.2
SBC	20 Sept	UPPER	2	0	0.0	39.4
SBC	24 Sept	UPPER	1	0	0.0	39.0
SBC	1 Oct	UPPER	1	0	0.0	50.2
SBC	3 Oct	BACK	2	0	0.0	153
SBC	4 Oct	BACK	10	2	20.0	90.4
SBC	6 Oct	BACK	2	0	0.0	62.9
SBC	8 Oct	BACK	2	0	0.0	106
SBC	11 Oct	BACK	8	0	0.0	74.9
SBC	15 Oct	BACK	2	0	0.0	60.9
SBC	18 Oct	BACK	1	1	100.0	66.2
SBC	22 Oct	BACK	42	8	19.0	132
SBC	25 Oct	BACK	19	5	26.3	162
SBC	29 Oct	BACK	17	1	5.9	98.1
SBC	1 Nov	BACK	31	6	19.3	86.4

SBC	5 Nov	BACK	12	2	16.7	88
SBC	8 No	BACK	6	1	16.7	80.9
SBC	12 Nov	BACK	19	5	26.3	109
SBC	13 Nov	BACK	10	0	0.0	156
SBC	15 Nov	BACK	29	4	13.8	119
SBC	19 Nov	BACK	115	26	22.6	195
SBC	20 Nov	BACK	1	0	0.0	169
SBC	22 Nov	BACK	7	2	28.6	131
SBC	24 Nov	BACK	4	0	0.0	118
SBC	26 Nov	BACK	6	1	16.7	106
SBC	29 Nov	BACK	13	3	23.1	99.2

E.3.5 Steelhead/Rainbow Trout Smolts and Parr

We completed 72 marked group releases for emigrating steelhead in 2007. Of the releases, only 8 met the criteria to be included in the analysis (n≥25). The results of the regression were not significant ($p = 0.12$; $r^2 = 0.10$). A pooled trap efficiencies of 6.8% (March-July; 'back' position), 6.9% (August – September; 'upper' position), and 5.1% (October –December; 'back' position; Table 10) was used to estimate the production of emigrating steelhead in Nason Creek. We estimate that 25108 (± 991 95% CI) steelhead emigrated from Nason Creek in 2007. At the time of this draft, scale analysis data was not available to calculate brood year emigration estimate.

Table 11. Mark/recapture efficiency trials used to estimate emigration of steelhead in Nason Creek. All releases were used for a pooled estimate; Only releases with >25 fish were used in the regression analysis. (SST = summer steelhead trout)

Species	Date	Trap Position	Number Released	Number Recaptured	Efficiency (%)	Discharge (m^3/s)
SST	3 March	BACK	1	0	0.00	210
SST	6 March	BACK	1	0	0.0	194
SST	9 March	BACK	7	1	14.3	213
SST	17 March	BACK	17	0	0.0	933
SST	20 March	BACK	55	1	1.82	1410
SST	23 March	BACK	21	0	0.0	878
SST	26 March	BACK	13	0	0.0	2150
SST	31 March	BACK	56	4	7.1	866
SST	3 April	BACK	35	1	2.9	666
SST	6 April	BACK	25	1	4.0	598
SST	10 April	BACK	60	8	13.3	965
SST	13 April	BACK	23	2	8.7	721
SST	17 April	BACK	26	2	7.7	623
SST	20 April	BACK	22	6	27.3	541
SST	24 April	BACK	24	1	41.7	578
SST	27 April	BACK	43	2	4.6	586
SST	1 May	BACK	52	2	3.8	720
SST	8 May	BACK	4	0	0.0	1160
SST	19 May	BACK	6	0	0.0	1450

SST	20 May	BACK	3	0	0.0	1220
SST	22 May	BACK	3	0	0.0	895
SST	23 May	BACK	10	0	0.0	891
SST	24 May	BACK	7	0	0.0	946
SST	25 May	BACK	6	0	0.0	1050
SST	26 May	BACK	3	0	0.0	1160
SST	27 May	BACK	3	0	0.0	1480
SST	28 May	BACK	3	0	0.0	1110
SST	29 May	BACK	2	0	0.0	1010
SST	30 May	BACK	11	0	0.0	1250
SST	31 May	BACK	5	0	0.0	1660
SST	1 June	BACK	8	0	0.0	765
SST	2 June	BACK	3	0	0.0	2530
SST	9 June	BACK	151	17	11.3	785
SST	12 June	BACK	65	8	12.3	676
SST	14 June	BACK	61	5	8.2	765
SST	15 June	BACK	21	0	0.0	663
SST	17 June	BACK	11	2	18.2	608
SST	18 June	BACK	21	2	9.5	581
SST	19 June	BACK	22	0	0.0	567
SST	21 June	BACK	67	4	6.0	675
SST	22 June	BACK	63	5	7.9	630
SST	26 June	BACK	16	3	18.7	408
SST	27 June	BACK	13	0	0.0	418
SST	28 June	BACK	31	4	30.8	439
SST	29 June	BACK	19	0	23.1	454
SST	2 July	BACK	11	2	18.1	222
SST	5 July	BACK	26	1	3.8	406
SST	6 July	BACK	8	0	0.0	389
SST	7 July	BACK	16	0	0.0	329
SST	8 July	BACK	11	1	9.1	281
SST	9 July	BACK	27	1	3.7	260
SST	13 August	UPPER	6	1	16.7	54.5
SST	20 August	UPPER	1	0	0.0	60.2
SST	23 August	UPPER	2	0	0.0	51.8
SST	27 August	UPPER	1	0	0.0	46.5
SST	6 Sept	UPPER	3	0	0.0	41.6
SST	10 Sept	UPPER	7	1	14.2	39.8
SST	13 Sep	UPPER	3	0	0.0	43.5
SST	17 Sept	UPPER	1	0	0.0	39.5
SST	20 Sept	UPPER	2	0	0.0	39.4
SST	4 Oct	BACK	11	1	9.1	90.4
SST	5 Oct	BACK	16	0	0.0	72
SST	8 Oct	BACK	4	0	0.0	106
SST	11 Oct	BACK	3	0	0.0	74.9
SST	18 Oct	BACK	1	0	0.0	66.2
SST	22 Oct	BACK	4	0	0.0	132

SST	25 Oct	BACK	7	0	0.0	162
SST	29 Oct	BACK	2	0	0.0	98.1
SST	1 Nov	BACK	1	0	0.0	86.4
SST	13 Nov	BACK	1	0	0.0	156
SST	19 Nov	BACK	26	3	11.5	195
SST	22 Nov	BACK	2	0	0.0	131
SST	24 Nov	BACK	1	0	0.0	118

E.4 PIT Tagging

During the 2007 trapping season we PIT tagged 1,071 spring Chinook, 1,312 steelhead, and 28 wild coho (Table 15). This equates to 67.4% of the Chinook, 74.0% of steelhead, and 63.6% of all wild coho salmon captured at the trap. All tagging files have been reported to the PTAGIS database.

E.5 Incidental Species

All of the known fish species present in Nason Creek were represented in the trap catch: Chinook salmon *Oncorhynchus tshawytscha*, steelhead trout and rainbow trout *Oncorhynchus mykiss*, coho salmon *Oncorhynchus kisutch*, cutthroat trout *Oncorhynchus clarki lewisi*, bull trout *Salvelinus confluentus*, mountain whitefish *Prosopium williamsoni*, redside shiner *Richardsonius balteatus*, sucker *Catostomus sp*, sculpin *Cottus sp*, dace *Rhinichthys sp* and northern pikeminnow *Ptychocheilus oregonensis.* Hatchery steelhead and coho were also caught. Incidental species were enumerated and sampled for length and weight (Table 11).

Table 12. Number and mean fork length of incidental species collected in Nason Creek, 2007.

Species	Captured	Fork Length (mm)			Weight (g)		
		Mean	N	SD	Mean	N	SD
Dace *Rhinichthys sp.*	180	82.1	175	26.1	8.4	175	6.1
Whitefish *Prosopium sp.*	166	67.5	164	23.9	4.4	164	15.6
Sculpin *Cottus sp.*	92	102.5	89	38.3	21.7	88	20.7
Sucker *Catostomas sp.*	85	109.4	85	30.9	20.1	85	28.0
Bull Trout *Salvelinus confluentus*	17	167.1	16	72.1	25.7	14	5.9
Northern Pikeminnow *Ptychocheilus oregonensis*	7	192.6	7	100.4	118.3	7	188.1
Cutthroat Trout *Oncorhynchus clarki lewisi*	4	159.7	4	20.0	40.7	4	14.2
Hatchery Steelhead *Oncorhynchus mykiss*	2717	n/a	n/a	n/a	n/a	n/a	n/a
Hatchery Coho *Oncorhynchus kisutch*	13650	n/a	n/a	n/a	n/a	n/a	n/a

E.6 ESA Compliance

The Nason Creek smolt trap is operated under consultation with the NMFS (permit no. 1493) and under consultation with the USFWS (permit no. TE037151-3). In 2007, we remained in compliance with all permits. The observed trap efficiencies were well within the acceptable level of the ESA permit conditions (i.e., <20%). Numbers of mortalities for each species and life stage are listed in Table 12 and were within acceptable limits (<2% for Chinook and steelhead; <2 individuals for bull trout).

Table 13. 2007 Nason Creek ESA listed species handling and mortality summary.

Species	Total Collected	Total Mortality	% Handled Mortality
Spring Chinook Fry and Subyearlings (BY 2006)	764	8	1.0%
Spring Chinook Yearling (BY 05)	691	9	1.3%
Steelhead Fry and Parr	1674	8	0.5%
Steelhead Smolt	117	0	0.0%
Bull Trout	17	0	0.0%

F. Discussion

The trap location appears appropriate for the target species. The Nason Creek smolt trap is intentionally positioned as low as possible in the Nason Creek watershed to ensure that the majority of spawning occurs upstream of the trap. Located at RK 0.8, very limited production occurs downstream from the trap. Low efficiencies and low juvenile abundance limited our ability to conduct trap efficiency trials over a broad range of river conditions. As a result, inadequate trap efficiency-to-discharge regression models forced the use of pooled trap efficiencies. Once regression models have been developed, population estimates will be recalculated. Currently, observed pooled trap efficiencies are within the acceptable level of the ESA permit conditions (i.e., <20%). In recent years, summer Chinook have occasionally been observed spawning in Nason Creek. Results of genetic analysis may differentiate spring runs from summer Chinook runs.

A retrospective analysis of data from previous years will be necessary, pending establishment of a trap efficiency-discharge regression model and genetic data differentiating spring chinook emigrants from summer Chinook emigrants. This retrospective analysis should provide more robust smolt estimates. Until such time, all results in this report should be considered provisional.

We have operated the Nason Creek smolt trap for the calculation of spring Chinook, steelhead, and coho salmon population estimates since 2004. Early indicators imply that productivity of spring Chinook in Nason Creek is lower that values reported for the Chiwawa River (Hillman et al. 2007). However, the mean productivity for spring Chinook in Nason Creek appears higher than Chinook productivity estimates collected in the Twisp and Methow Rivers (Snow et al. 2007). These early comparisons with results from other smolt traps in the Wenatchee and Methow Basins will help researchers and fish managers understand the reproductive success and carrying capacity of spring Chinook and steelhead in Nason Creek. Currently, the reasons for differences in productivity between populations and overall juvenile production are not known.

Beginning in 2007 we operated a smolt trap in the White River with the same objectives as the Nason Creek smolt trap. To date we are not able to report productivity estimates for a complete brood year but future analyses should provide estimates for smolt production and egg-to-emigrant survival (productivity) that may be compared with those values in Nason Creek.

Steelhead emigrate at different life stages, some as smolts in the spring and others as parr throughout the year. With multiple age classes of steelhead emigrating as both parr and smolt, scale sample analysis is necessary to calculate brood year population estimates. Scale sampling of steelhead smolts began in spring of 2005. Scales were taken from all steelhead parr >100 mm. Results from 2007 are not yet available. Therefore it was not possible to calculate brood year based emigration estimates and measures of productivity at the time of this draft. As results become available, brood year survival and productivity estimates will be provided reported in future documents.

Preliminary conclusions can be made regarding emigration timing of spring Chinook and steelhead within Nason Creek. There appear to be two distinct emigrations of spring Chinook, a group of yearlings which over wintered and emigrated in the spring and a subyearling group of migrants during summer and fall. This pattern is typical of those observed in other upper Columbia tributaries (Hillman et al. 2007). Whereas steelhead parr, in 2007, emigrated from Nason Creek throughout the trapping season with only one distinct peak emigration period in the spring.

G. Literature Cited

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US Forest Service 1996. Nason Creek Stream Survey Report

APPENDIX A: Nason Creek Temperature and Discharge Data

APPENDIX A: Nason Creek Temperature and Discharge Data

DATE	Mean Daily Discharge (CFS)	Mean Daily Temp C
1-Jan-07	291	0.071
2-Jan-07	498	0.068
3-Jan-07	1130	0.203
4-Jan-07	639	1.092
5-Jan-07	531	0.455
6-Jan-07	513	0.27
7-Jan-07	543	0.91
8-Jan-07	644	1.727
9-Jan-07	[]	
10-Jan-07	[]	
11-Jan-07	273	0.285
12-Jan-07	258	0.044
13-Jan-07	320	0.05
14-Jan-07	314	0.051
15-Jan-07	357	0.051
16-Jan-07	410	0.051
17-Jan-07	505	0.052
18-Jan-07	569	0.052
19-Jan-07	610	0.053
20-Jan-07	550	0.053
21-Jan-07	481	0.054
22-Jan-07	338	0.195
23-Jan-07	193	1.831
24-Jan-07	202	2.234
25-Jan-07	190	2.157
26-Jan-07	183	1.649
27-Jan-07	175	0.701
28-Jan-07	172	0.066
29-Jan-07	195	0.05
30-Jan-07	225	0.044
31-Jan-07	311	0.049

Data provided by DOE and should be considered provisional

APPENDIX A: Nason Creek Temperature and Discharge Data

DATE	Mean Daily Discharge (CFS)	Mean Daily Temp C
1-Feb-07	347	0.053
2-Feb-07	422	0.051
3-Feb-07	468	0.053
4-Feb-07	364	0.061
5-Feb-07	209	0.239
6-Feb-07	154	1.595
7-Feb-07	158	2.303
8-Feb-07	161	2.744
9-Feb-07	164	2.926
10-Feb-07	164	2.907
11-Feb-07	169	2.743
12-Feb-07	169	2.978
13-Feb-07	168	3.067
14-Feb-07	169	2.261
15-Feb-07	215	1.709
16-Feb-07	469	1.975
17-Feb-07	363	3.018
18-Feb-07	362	3.171
19-Feb-07	351	2.849
20-Feb-07	404	2.61
21-Feb-07	350	2.215
22-Feb-07	318	2.698
23-Feb-07	291	2.227
24-Feb-07	274	1.563
25-Feb-07	261	2.165
26-Feb-07	241	2.644
27-Feb-07	225	2.323
28-Feb-07	227	2.115

Data provided by DOE and should be considered provisional

APPENDIX A: Nason Creek Temperature and Discharge Data

DATE	Mean Daily Discharge (CFS)	Mean Daily Temp C
1-Mar-07	226	1.636
2-Mar-07	213	0.797
3-Mar-07	210	2.401
4-Mar-07	200	3.26
5-Mar-07	191	3.764
6-Mar-07	194	3.851
7-Mar-07	201	3.544
8-Mar-07	210	3.509
9-Mar-07	213	4.172
10-Mar-07	227	4.093
11-Mar-07	514	3.841
12-Mar-07	3100	1.825
13-Mar-07	2350	3.333
14-Mar-07	1310	3.074
15-Mar-07	910	2.978
16-Mar-07	843	3.289
17-Mar-07	933	3.596
18-Mar-07	1700	3.785
19-Mar-07	1720	3.944
20-Mar-07	1410	3.972
21-Mar-07	1030	3.836
22-Mar-07	913	3.936
23-Mar-07	878	3.997
24-Mar-07	2060	4.118
25-Mar-07	3430	3.871
26-Mar-07	2150	3.819
27-Mar-07	1550	3.836
28-Mar-07	1130	3.982
29-Mar-07	950	4.109
30-Mar-07	881	4.297
31-Mar-07	866	4.59

Data provided by DOE and should be considered provisional

APPENDIX A: Nason Creek Temperature and Discharge Data

DATE	Mean Daily Discharge (CFS)	Mean Daily Temp C
1-Apr-07	818	4.56
2-Apr-07	734	4.285
3-Apr-07	666	3.848
4-Apr-07	624	4.189
5-Apr-07	589	4.477
6-Apr-07	598	5.092
7-Apr-07	679	5.42
8-Apr-07	823	5.574
9-Apr-07	1070	5.536
10-Apr-07	965	5.142
11-Apr-07	838	4.801
12-Apr-07	766	4.713
13-Apr-07	721	4.828
14-Apr-07	703	5.033
15-Apr-07	685	5.246
16-Apr-07	660	5.14
17-Apr-07	623	5.124
18-Apr-07	594	5.274
19-Apr-07	565	5.312
20-Apr-07	541	5.323
21-Apr-07	525	5.213
22-Apr-07	509	5.53
23-Apr-07	536	6.051
24-Apr-07	578	6.467
25-Apr-07	581	6.276
26-Apr-07	558	5.989
27-Apr-07	586	5.92
28-Apr-07	765	6.012
29-Apr-07	807	5.934
30-Apr-07	705	5.723

Data provided by DOE and should be considered provisional

APPENDIX A: Nason Creek Temperature and Discharge Data

DATE	Mean Daily Discharge (CFS)	Mean Daily Temp C
1-May-07	720	5.903
2-May-07	771	5.888
3-May-07	772	5.774
4-May-07	685	5.713
5-May-07	633	5.756
6-May-07	621	5.962
7-May-07	775	6.382
8-May-07	1160	6.533
9-May-07	1580	6.641
10-May-07	1320	6.445
11-May-07	1230	6.278
12-May-07	1350	6.287
13-May-07	1430	6.324
14-May-07	1060	6.126
15-May-07	1150	6.202
16-May-07	1630	6.38
17-May-07	1760	6.567
18-May-07	1510	6.538
19-May-07	1450	6.55
20-May-07	1220	6.39
21-May-07	1110	6.228
22-May-07	895	6.227
23-May-07	891	6.584
24-May-07	946	6.789
25-May-07	1050	6.944
26-May-07	1160	6.973
27-May-07	1480	7.079
28-May-07	1110	6.935
29-May-07	1010	6.943
30-May-07	1250	7.118
31-May-07	1660	7.34

Data provided by DOE and should be considered provisional

APPENDIX A: Nason Creek Temperature and Discharge Data

DATE	Mean Daily Discharge (CFS)	Mean Daily Temp C
1-Jun-07	1910	7.509
2-Jun-07	2160	7.619
3-Jun-07	2530	7.746
4-Jun-07	2660	7.858
5-Jun-07	2020	7.705
6-Jun-07	1200	7.168
7-Jun-07	841	6.945
8-Jun-07	765	7.416
9-Jun-07	785	7.636
10-Jun-07	848	7.555
11-Jun-07	798	7.587
12-Jun-07	676	7.531
13-Jun-07	675	8.335
14-Jun-07	668	8.124
15-Jun-07	663	8.175
16-Jun-07	610	7.804
17-Jun-07	608	8.148
18-Jun-07	581	8.402
19-Jun-07	567	8.616
20-Jun-07	615	9.273
21-Jun-07	675	9.874
22-Jun-07	630	9.634
23-Jun-07	550	9.226
24-Jun-07	501	9.079
25-Jun-07	461	8.663
26-Jun-07	408	9.037
27-Jun-07	418	9.738
28-Jun-07	439	10.012
29-Jun-07	454	10.129
30-Jun-07	430	10.004

Data provided by DOE and should be considered provisional

APPENDIX A: Nason Creek Temperature and Discharge Data

DATE	Mean Daily Discharge (CFS)	Mean Daily Temp C
1-Jul-07	403	10.54
2-Jul-07	398	11.235
3-Jul-07	386	11.741
4-Jul-07	388	12.287
5-Jul-07	406	13.135
6-Jul-07	389	13.839
7-Jul-07	329	13.539
8-Jul-07	281	13.371
9-Jul-07	260	13.727
10-Jul-07	241	14.186
11-Jul-07	222	14.599
12-Jul-07	210	15.012
13-Jul-07	198	14.936
14-Jul-07	186	15.454
15-Jul-07	169	16.092
16-Jul-07	157	15.961
17-Jul-07	144	15.403
18-Jul-07	141	14.678
19-Jul-07	141	14.175
20-Jul-07	129	13.961
21-Jul-07	123	13.36
22-Jul-07	117	13.877
23-Jul-07	110	14.58
24-Jul-07	104	15.3
25-Jul-07	97.9	15.264
26-Jul-07	92.8	15.815
27-Jul-07	88.2	16.217
28-Jul-07	84.3	16.307
29-Jul-07	80.9	16.397
30-Jul-07	79	15.894
31-Jul-07	75.7	15.599

Data provided by DOE and should be considered provisional

APPENDIX A: Nason Creek Temperature and Discharge Data

DATE	Mean Daily Discharge (CFS)	Mean Daily Temp C
1-Aug-07	73.1	15.826
2-Aug-07	70	16.269
3-Aug-07	72.9	16.42
4-Aug-07	75.3	16.086
5-Aug-07	64.5	16.045
6-Aug-07	63.2	16.35
7-Aug-07	60.8	16.487
8-Aug-07	60.6	16.123
9-Aug-07	60.5	15.681
10-Aug-07	58.1	15.349
11-Aug-07	56.9	15.032
12-Aug-07	55	15.131
13-Aug-07	54.5	14.552
14-Aug-07	52.9	15.029
15-Aug-07	52.9	15.596
16-Aug-07	54.7	15.982
17-Aug-07	55.5	15.844
18-Aug-07	54.4	15.543
19-Aug-07	55.3	15.138
20-Aug-07	60.2	14.167
21-Aug-07	62.6	13.849
22-Aug-07	57.2	14.398
23-Aug-07	51.8	14.799
24-Aug-07	49.3	14.975
25-Aug-07	46.3	15.208
26-Aug-07	45.5	15.157
27-Aug-07	46.5	14.295
28-Aug-07	44.1	14.145
29-Aug-07	45.5	15.59
30-Aug-07	47.5	15.928
31-Aug-07	46.6	15.865

Data provided by DOE and should be considered provisional

APPENDIX A: Nason Creek Temperature and Discharge Data

DATE	Mean Daily Discharge (CFS)	Mean Daily Temp C
1-Sep-07	45.9	15.403
2-Sep-07	45	15.604
3-Sep-07	43.5	16.421
4-Sep-07	43	16.665
5-Sep-07	42.6	16.282
6-Sep-07	41.6	16.121
7-Sep-07	40.7	14.924
8-Sep-07	41	13.745
9-Sep-07	40.8	13.083
10-Sep-07	39.8	13.318
11-Sep-07	39.2	14.066
12-Sep-07	38.3	15.024
13-Sep-07	38.4	14.85
14-Sep-07	38.4	14.479
15-Sep-07	37.8	14.642
16-Sep-07	37.5	13.65
17-Sep-07	39.2	12.935
18-Sep-07	40.6	12.652
19-Sep-07	39.6	11.864
20-Sep-07	39.4	11.105
21-Sep-07	38.8	10.81
22-Sep-07	37.8	11.742
23-Sep-07	39.1	10.483
24-Sep-07	39	10.314
25-Sep-07	37.7	11.371
26-Sep-07	37.5	11.64
27-Sep-07	37.6	11.336
28-Sep-07	37.2	11.187
29-Sep-07	40.7	9.045
30-Sep-07	43.8	8.811

Data provided by DOE and should be considered provisional

APPENDIX A: Nason Creek Temperature and Discharge Data

DATE	Mean Daily Discharge (CFS)	Mean Daily Temp C
1-Oct-07	50.2	9.397
2-Oct-07	75.8	9.115
3-Oct-07	153	7.796
4-Oct-07	90.4	7.213
5-Oct-07	72	7.369
6-Oct-07	62.9	7.848
7-Oct-07	67.3	8.82
8-Oct-07	106	8.1
9-Oct-07	81.3	8.803
10-Oct-07	72.4	9.284
11-Oct-07	74.9	8.434
12-Oct-07	70.4	8.624
13-Oct-07	66.9	8.414
14-Oct-07	63.1	7.822
15-Oct-07	60.9	7.932
16-Oct-07	61.5	8.113
17-Oct-07	62.9	6.677
18-Oct-07	66.2	5.605
19-Oct-07	104	6.267
20-Oct-07	124	5.767
21-Oct-07	97.3	5.541
22-Oct-07	132	6.813
23-Oct-07	169	7.18
24-Oct-07	166	7.045
25-Oct-07	162	5.828
26-Oct-07	129	4.368
27-Oct-07	114	3.637
28-Oct-07	104	3.754
29-Oct-07	98.1	4.3
30-Oct-07	94.5	4.239
31-Oct-07	89.2	3.192

Data provided by DOE and should be considered provisional

APPENDIX A: Nason Creek Temperature and Discharge Data

DATE	Mean Daily Discharge (CFS)	Mean Daily Temp C
1-Nov-07	86.4	3.645
2-Nov-07	82.2	3.192
3-Nov-07	80.7	4.926
4-Nov-07	85.3	6.877
5-Nov-07	88	5.153
6-Nov-07	81.3	3.869
7-Nov-07	78.9	4.549
8-Nov-07	80.9	6.043
9-Nov-07	83.4	6.83
10-Nov-07	116	6.263
11-Nov-07	118	4.584
12-Nov-07	109	3.636
13-Nov-07	156	2.882
14-Nov-07	118	2.561
15-Nov-07	119	2.741
16-Nov-07	283	3.18
17-Nov-07	265	3.213
18-Nov-07	249	3.167
19-Nov-07	195	3.167
20-Nov-07	169	2.926
21-Nov-07	148	2.254
22-Nov-07	131	1.029
23-Nov-07	116	0.22
24-Nov-07	118	0.415
25-Nov-07	117	0.785
26-Nov-07	106	0.608
27-Nov-07	107	0.433
28-Nov-07	104	0.649
29-Nov-07	99.2	0.902
30-Nov-07	96.7	

Data provided by DOE and should be considered provisional

APPENDIX A: Nason Creek Temperature and Discharge Data

DATE	Mean Daily Discharge (CFS)	Mean Daily Temp C
1-Dec-07	93.3	
2-Dec-07	89.4	
3-Dec-07	178	
4-Dec-07	1340	
5-Dec-07	1260	
6-Dec-07	574	
7-Dec-07	406	
8-Dec-07	324	
9-Dec-07	291	
10-Dec-07	260	
11-Dec-07	251	
12-Dec-07	217	
13-Dec-07	202	
14-Dec-07	[]	
15-Dec-07	185	
16-Dec-07	176	
17-Dec-07	168	
18-Dec-07	161	
19-Dec-07		
20-Dec-07		
21-Dec-07		
22-Dec-07		
23-Dec-07		
24-Dec-07		
25-Dec-07		
26-Dec-07		
27-Dec-07		
28-Dec-07		
29-Dec-07		
30-Dec-07		
31-Dec-07		

Data provided by DOE and should be considered provisional

APPENDIX B: Daily Trap Operating Status

APPENDIX B: Daily Trap Operating Status

Date	Status	Comments
1-Mar-07	Operating	
2-Mar-07	Operating	
3-Mar-07	Operating	
4-Mar-07	Operating	
5-Mar-07	Operating	
6-Mar-07	Operating	
7-Mar-07	Operating	
8-Mar-07	Operating	
9-Mar-07	Operating	
10-Mar-07	Operating	
11-Mar-07	Operating	
12-Mar-07	Operating	
13-Mar-07	Not Operating	High Water
14-Mar-07	Not Operating	High Water
15-Mar-07	Operating	
16-Mar-07	Operating	
17-Mar-07	Operating	
18-Mar-07	Operating	
19-Mar-07	Operating	
20-Mar-07	Operating	
21-Mar-07	Operating	
22-Mar-07	Operating	
23-Mar-07	Operating	
24-Mar-07	Operating	
25-Mar-07	Incomplete	Trap Stopped - Debris
26-Mar-07	Not Operating	High Water
27-Mar-07	Operating	
28-Mar-07	Operating	
29-Mar-07	Operating	
30-Mar-07	Operating	
31-Mar-07	Operating	

APPENDIX B: Daily Trap Operating Status

Date	Status	Comments
1-Apr-07	Operating	
2-Apr-07	Operating	
3-Apr-07	Operating	
4-Apr-07	Operating	
5-Apr-07	Operating	
6-Apr-07	Operating	
7-Apr-07	Operating	
8-Apr-07	Incomplete	Trap Stopped - Debris
9-Apr-07	Operating	
10-Apr-07	Operating	
11-Apr-07	Operating	
12-Apr-07	Operating	
13-Apr-07	Operating	
14-Apr-07	Operating	
15-Apr-07	Operating	
16-Apr-07	Operating	
17-Apr-07	Operating	
18-Apr-07	Operating	
19-Apr-07	Operating	
20-Apr-07	Operating	
21-Apr-07	Operating	
22-Apr-07	Operating	
23-Apr-07	Operating	
24-Apr-07	Operating	
25-Apr-07	Operating	
26-Apr-07	Operating	
27-Apr-07	Operating	
28-Apr-07	Operating	
29-Apr-07	Operating	
30-Apr-07	Operating	

APPENDIX B: Daily Trap Operating Status

Date	Status	Comments
1-May-07	Operating	
2-May-07	Not Operating	Hatchery Steelhead Release
3-May-07	Incomplete	Hatchery Steelhead Release
4-May-07	Incomplete	Hatchery Steelhead Release
5-May-07	Not Operating	Hatchery Steelhead Release
6-May-07	Operating	
7-May-07	Operating	
8-May-07	Operating	
9-May-07	Incomplete	
10-May-07	Operating	
11-May-07	Operating	
12-May-07	Operating	
13-May-07	Operating	
14-May-07	Operating	
15-May-07	Operating	
16-May-07	Operating	
17-May-07	Operating	
18-May-07	Operating	
19-May-07	Operating	
20-May-07	Operating	
21-May-07	Operating	
22-May-07	Operating	
23-May-07	Operating	
24-May-07	Operating	
25-May-07	Operating	
26-May-07	Operating	
27-May-07	Operating	
28-May-07	Operating	
29-May-07	Operating	
30-May-07	Operating	
31-May-07	Incomplete	Trap Stopped - Debris

APPENDIX B: Daily Trap Operating Status

Date	Status	Comments
1-Jun-07	Operating	
2-Jun-07	Operating	
3-Jun-07	Not Operating	High Water
4-Jun-07	Not Operating	High Water
5-Jun-07	Not Operating	High Water
6-Jun-07	Not Operating	High Water
7-Jun-07	Operating	
8-Jun-07	Operating	
9-Jun-07	Operating	
10-Jun-07	Operating	
11-Jun-07	Operating	
12-Jun-07	Operating	
13-Jun-07	Operating	
14-Jun-07	Operating	
15-Jun-07	Operating	
16-Jun-07	Operating	
17-Jun-07	Operating	
18-Jun-07	Operating	
19-Jun-07	Operating	
20-Jun-07	Operating	
21-Jun-07	Operating	
22-Jun-07	Operating	
23-Jun-07	Operating	
24-Jun-07	Operating	
25-Jun-07	Operating	
26-Jun-07	Operating	
27-Jun-07	Operating	
28-Jun-07	Operating	
29-Jun-07	Operating	
30-Jun-07	Operating	

APPENDIX B: Daily Trap Operating Status

Date	Status	Comments
1-Jul-07	Incomplete	Trap Stopped - Debris
2-Jul-07	Operating	
3-Jul-07	Operating	
4-Jul-07	Operating	
5-Jul-07	Operating	
6-Jul-07	Operating	
7-Jul-07	Operating	
8-Jul-07	Operating	
9-Jul-07	Operating	
10-Jul-07	Operating	
11-Jul-07	Operating	
12-Jul-07	Incomplete	Trap Stopped - Debris
13-Jul-07	Operating	
14-Jul-07	Operating	
15-Jul-07	Operating	
16-Jul-07	Operating	
17-Jul-07	Operating	
18-Jul-07	Operating	
19-Jul-07	Operating	
20-Jul-07	Incomplete	Trap Stopped - Debris
21-Jul-07	Operating	
22-Jul-07	Operating	
23-Jul-07	Operating	
24-Jul-07	Operating	
25-Jul-07	Operating	
26-Jul-07	Operating	
27-Jul-07	Operating	
28-Jul-07	Operating	
29-Jul-07	Operating	
30-Jul-07	Operating	
31-Jul-07	Operating	

APPENDIX B: Daily Trap Operating Status

Date	Status	Comments
1-Aug-07	Operating	
2-Aug-07	Operating	
3-Aug-07	Incomplete	Trap Stopped - Debris
4-Aug-07	Operating	
5-Aug-07	Operating	
6-Aug-07	Operating	
7-Aug-07	Operating	
8-Aug-07	Operating	
9-Aug-07	Operating	
10-Aug-07	Operating	
11-Aug-07	Operating	
12-Aug-07	Operating	
13-Aug-07	Operating	
14-Aug-07	Operating	
15-Aug-07	Operating	
16-Aug-07	Operating	
17-Aug-07	Operating	
18-Aug-07	Operating	
19-Aug-07	Operating	
20-Aug-07	Operating	
21-Aug-07	Operating	
22-Aug-07	Operating	
23-Aug-07	Operating	
24-Aug-07	Operating	
25-Aug-07	Operating	
26-Aug-07	Operating	
27-Aug-07	Operating	
28-Aug-07	Operating	
29-Aug-07	Operating	
30-Aug-07	Operating	
31-Aug-07	Operating	

APPENDIX B: Daily Trap Operating Status

Date	Status	Comments
1-Sep-07	Operating	
2-Sep-07	Operating	
3-Sep-07	Incomplete	Low Water
4-Sep-07	Not Operating	Low Water
5-Sep-07	Not Operating	Low Water
6-Sep-07	Operating	
7-Sep-07	Operating	
8-Sep-07	Operating	
9-Sep-07	Operating	
10-Sep-07	Operating	
11-Sep-07	Operating	
12-Sep-07	Operating	
13-Sep-07	Operating	
14-Sep-07	Operating	
15-Sep-07	Operating	
16-Sep-07	Incomplete	Low Water
17-Sep-07	Incomplete	Low Water
18-Sep-07	Operating	
19-Sep-07	Operating	
20-Sep-07	Operating	
21-Sep-07	Operating	
22-Sep-07	Operating	
23-Sep-07	Operating	
24-Sep-07	Operating	
25-Sep-07	Operating	
26-Sep-07	Operating	
27-Sep-07	Operating	
28-Sep-07	Operating	
29-Sep-07	Operating	
30-Sep-07	Operating	

APPENDIX B: Daily Trap Operating Status

Date	Status	Comments
1-Oct-07	Operating	
2-Oct-07	Operating	
3-Oct-07	Operating	
4-Oct-07	Operating	
5-Oct-07	Incomplete	
6-Oct-07	Operating	
7-Oct-07	Operating	
8-Oct-07	Operating	
9-Oct-07	Operating	
10-Oct-07	Operating	
11-Oct-07	Operating	
12-Oct-07	Operating	
13-Oct-07	Operating	
14-Oct-07	Operating	
15-Oct-07	Operating	
16-Oct-07	Operating	
17-Oct-07	Operating	
18-Oct-07	Operating	
19-Oct-07	Operating	
20-Oct-07	Operating	
21-Oct-07	Operating	
22-Oct-07	Operating	
23-Oct-07	Operating	
24-Oct-07	Operating	
25-Oct-07	Operating	
26-Oct-07	Operating	
27-Oct-07	Operating	
28-Oct-07	Operating	
29-Oct-07	Operating	
30-Oct-07	Operating	
31-Oct-07	Operating	

APPENDIX B: Daily Trap Operating Status

Date	Status	Comments
1-Nov-07	Operating	
2-Nov-07	Operating	
3-Nov-07	Operating	
4-Nov-07	Operating	
5-Nov-07	Operating	
6-Nov-07	Operating	
7-Nov-07	Operating	
8-Nov-07	Operating	
9-Nov-07	Operating	
10-Nov-07	Operating	
11-Nov-07	Operating	
12-Nov-07	Operating	
13-Nov-07	Operating	
14-Nov-07	Operating	
15-Nov-07	Operating	
16-Nov-07	Operating	
17-Nov-07	Operating	
18-Nov-07	Operating	
19-Nov-07	Operating	
20-Nov-07	Operating	
21-Nov-07	Operating	
22-Nov-07	Operating	
23-Nov-07	Operating	
24-Nov-07	Operating	
25-Nov-07	Operating	
26-Nov-07	Operating	
27-Nov-07	Operating	
28-Nov-07	Operating	
29-Nov-07	Operating	
30-Nov-07	Operating	
1-Dec-07	Operating	Trap Removed for Winter