The Integrated Status and Effectiveness Monitoring Program

U.S. Forest Service Fish Abundance and Steelhead Redd Surveys Annual Report

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PREFACE

In 2008, the U.S. Forest Service performed steelhead redd surveys and snorkel surveys within the Wenatchee subbasin as two separate components of ISEMP (Integrated Status and Effectiveness Monitoring Program). This document includes data collected for these two survey periods. Steelhead redd surveys were completed by observing steelhead activity during the spring spawning period in 2008. Fish abundance and distribution was evaluated during summer 2008 using snorkeling and electrofishing surveys

Management within the ISEMP project requires effective communication between a broad pool of agencies and partnerships that include Bonneville Power Administration (BPA), National Oceanic & Atmospheric Administration (NOAA) Fisheries, Yakama Nation Fisheries, Washington Department of Fish and Wildlife (WDFW), the USDA Forest Service, the Washington Department of Ecology (WDOE), Terraqua, Inc, Chelan and Douglas Counties, and other local and professional scientists, surveyors, and agency personnel. Much of the project funding and budget is shared between these partners, so coordinating within a reasonable and agreeable timeframe, within agency regulations, and effectively establishing roles for each of the partners is imperative to accomplishing project objectives. This project was primarily funded by Bonneville Power Administration and NOAA Fisheries.

FORWARD

This contract report is one of a series of reports that document implementation components of the Bonneville Power Administration's (BPA) funded project: Integrated Status and Effectiveness Monitoring Program (ISEMP – BPA project #2003-017-00, Chris Jordan, NOAA-NWFSC project sponsor). Other components of the project are separately reported, as explained below.

The ISEMP project has been created as a cost effective means of developing protocols and new technologies, novel indicators, sample designs, analytical data management, 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 salmonids 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, ISEMP has adopted an approach 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 areas, 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 ISEMP, 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.

2008 Wenatchee Basin Steelhead Survey Sites

STEELHEAD REDD SURVEYS

Abstract

Steelhead redd surveys were performed in the Wenatchee River subbasin during spring of 2008 by the U.S. Forest Service (USFS). The purpose of these surveys was to document steelhead presence or absence along randomly selected survey locations. Index reaches along the major stream systems have been established since 2001 and are surveyed annually by the Washington Department of Fish and Wildlife (WDFW). Index reach data are used in conjunction with random site surveys performed by USFS to extrapolate total steelhead redd counts for the Wenatchee River subbasin each year. Site selection for this project was created around existing WDFW index reaches and is used to better understand Mid-Columbia steelhead distribution. We observed one steelhead redd in Mission Creek and one steelhead in Peshastin Creek during survey efforts in 2008.

Project area

The Wenatchee River provides a migration corridor between the Columbia River and headwater tributaries known to host populations of juvenile and adult salmonids. Historically, the Wenatchee River and its tributaries have provided important spawning and rearing habitat for Chinook, Coho, sockeye, bull trout, and steelhead. Spring and summer Chinook activity and summer steelhead activity has been well documented throughout the Wenatchee Basin by several agencies including the Washington Department of Fish and Wildlife (WDFW), Chelan County Public Utility District, Yakama Nation Fisheries, U.S. Forest Service (USFS), and United States Fish and Wildlife Service (USFWS). Upper Columbia Steelhead were declared endangered June 13, 2007. Steelhead use in smaller tributary streams to the Wenatchee River has not been systematically field reviewed until the establishment of ISEMP in 2004.

Tributary streams that flow into the Wenatchee River are thought to be especially important for steelhead because of cool water temperatures and complex habitat. Steelhead have the most complex life history pattern of the anadromous salmonids (Shapovalov and Taft 1954). Preferred temperatures for steelhead spawning range from 39° to 52°F (4° to 11°C) (McEwan and Jackson 1996). Steelhead often select pool tailouts or heads of riffles with well oxygenated gravels as redd locations (Shapovalov and Taft 1954).

All sites visited during the spring of 2008 were located within the Wenatchee River subbasin. Survey reaches for this project were randomly selected and many reaches are located in tributaries or headwater streams that may not have been previously investigated for steelhead spawning. This random approach when paired with non-random index reaches provides insight into overall steelhead abundance and distribution in the Wenatchee River system. In time, knowledge about tributary and mainstem utilization may illustrate areas that can be improved through restoration and mitigation. Thanks in large part to ISEMP-funded spawning ground

surveys, steelhead spawning data has been well documented in the White River, the Chiwawa River, Icicle Creek, Peshastin Creek, Nason Creek, Chumstick Creek and lower Mission Creek drainages.

Methods and Materials

We conducted steelhead spawning ground surveys at 25 randomly selected reach locations, based on a 5-year rotating panel design (Hillman 2005). Sites were selected independent of land ownership. Each reach was established by locating the survey point using a latitude-longitude on a GIS stream layer. Begin and end points were selected by measuring up and down 0.5 mile along the GIS layer. Those points (mid, begin, and end) were loaded in a GPS and surveyors navigated to them using the GPS units. The reach boundaries were flagged. Surveys were performed in an upstream direction, when possible. Several larger mainstem reaches required raft support and were surveyed downstream. Redds and/or fish presence was documented when observed. Stream temperature and time were recorded at the beginning and end of each survey. Detailed methods for steelhead redd surveys can be found in '*A Field Manual of Scientific Protocols for Steelhead Redd Surveys within the upper Columbia Monitoring Strategy*' (Moberg and Nelle 2008).

Most of our initial surveys were logistically challenging because they required snow travel in remote locations. Each survey was performed by walking the stream bank, wading the channel, or rafting as necessary. Sites that were dry were not dropped but were counted as one of the final 25 sites. All sites except dry ones received full effort, meaning that at least three visits were made to these locations at approximately 2-week intervals for each reach. Survey timing was clustered around the estimated peak run timing. To determine this we were in contact with local WDFW fisheries personnel prior to surveying to determine when run timing had begun as they perform annual steelhead spawning ground surveys in the mainstem Wenatchee River where mainstem spawning begins. Surveys occurred from late-March to mid-June 2008.

Significant coordination occurred between the U.S. Forest Service, Cascadia Conservation District, and private landowners so that proper access was granted for reaches that fell within privately-owned lands. Occasionally, landowner denial or stream hazards required us to shift the reach upstream or downstream as much as 0.5 mile as long as the original midpoint coordinate was still included within the 1-mile reach. If the midpoint could not be accessed the entire reach was dropped due to inadequate access. Sites where the midpoint was determined to be greater than 10 miles away from a trailhead, or was greater than 0.5 mile from a trail were dropped from sampling and a replacement site was selected.

Beginning in 2001, WDFW has conducted steelhead spawning ground surveys at index reaches each spring in the mainstem Wenatchee River and major tributaries known to host steelhead spawning. Pre-season coordination occurred with WDFW in 2007 to avoid duplicating steelhead spawning ground surveys at index reaches. Since index reaches are already surveyed by WDFW, we omitted site locations that entirely overlapped WDFW reaches and selected another site as a replacement.

The WDFW index reaches also include sections of Nason Creek, the White River, and the Chiwawa River drainages areas known to host steelhead spawning. According to surveyors from the WDFW, the majority of steelhead spawning occurs above Tumwater dam (WDFW 2007, personal comm.). Approximately 73-94% of the steelhead redds counted from 2001-2005 were found above Tumwater dam on the Wenatchee River and its tributaries (WDFW 2005). In 2002, a total of 475 steelhead redds were found upstream of Tumwater Dam, with most of them found in the Wenatchee River (Murdoch and Viola, 2003).

Results

A total of 25 sites were given full effort, where 23 sites were surveyed at least 3 times and 2 sites were found to be dry. Table 1. provides a summary of site information for several different attributes.

Table 1. Survey Site Attributes

<u>Survey Attribute</u>	
Sites Considered for Surveying:	53
Full Effort Sites (at least 3 visits):	23
Sites State Surveys/Overlaps- Omitted:	10
No defined channel or in lake/ Non-target sites:	9
Physically Inaccessible or Unsafe:	5
Landowner Denial:	4
Dry Sites:	2
Redds Observed:	1
Steelhead Observed:	1

This year we observed steelhead presence at 2 sampling sites. One steelhead redd was found in Mission Creek and one dead steelhead was found in Peshastin Creek (see Table 2 below).

Table 2. Sitelist and Steelhead Activity

Site #	Stream	Method: B=bank, W=wade, F=float	Date First Visit	Date Last Visit	# of Surveys	Date Observed STHD Activity	Total # Redds	Total # ST
WEN -79	Mission Creek	B/W	4/8/08	6/9/08	3			
WEN -80	Ruby Creek	B	4/11/08	6/5/08	3			
WEN -82	Brush Creek	B	4/8/08	5/28/08	3			
WEN -83	Yaksum Creek	B	4/9/08	5/22/08	3			
WEN -84	Peshastin Creek	B/W	3/28/08	6/5/08	4	3/28/08		1 dead
WEN -88	Railroad Canyon	B	4/8/08	5/21/08	3			
WEN -90	Chiwawa River	F	4/9/08	5/28/08	3			
WEN -91	Wenatchee River	F	4/3/08	5/14/08	3			
WEN -95	Wenatchee River	F	4/3/08	5/14/08	3			
WEN -98	Chiwawa River	F	4/9/08	5/28/08	3			
WEN -99	East Fork Mission Creek	B	4/2/08	5/16/08	3			
WEN -100	Wenatchee River	F	4/3/08	5/14/08	3			
WEN -325	Wenatchee River	F	4/3/08	5/14/08	3			
WEN -327	Unnamed trib to Wenatchee	B	4/17/08	dry	1			
WEN -332	Nason Creek	B/W	4/4/08	6/10/08	4			
WEN -334	Wenatchee River	F	4/3/08	5/14/08	3			
WEN -336	Grouse Creek	B/W	5/12/08	6/3/08	3			
WEN -337	Chiwaukum Creek	B	3/27/08	6/17/08	3			
WEN -338	Mission Creek (mouth)	W	4/1/08	5/7/08	3	4/24/08	1 redd	
WEN -341	Spromberg Canyon	B	4/4/08	5/22/08	3			
WEN -342	Chiwawa River	F	4/9/08	5/28/08	3			
WEN -343	Warm Springs Canyon	B	4/17/08	dry	1			

WEN-344	Trib to Second Creek	B	5/1/08	6/10/08	3			
WEN-347	Mission Creek	B	4/2/08	6/9/08	3			
WEN-350	Wenatchee River	F	4/3/08	5/14/08	3			

Table 3 shows georeferenced data for a steelhead redd observed in Mission Creek. Water temperature in Mission Creek during this survey was 5.5°C (See below).

Table 3. Redd Encountered

<u>Site #</u>	<u>Stream Name</u>	<u>Redd #</u>	<u>Latitude WGS84 N</u>	<u>Longitude WGS84 W</u>	<u>Date Observed</u>	<u>Redd Condition</u>	<u>Comments</u>
WEN-338	Mission Ck.	1	47.50869	120.47342	4/24/2007	complete	Definite pit and tailout. Possibly hydraulic

Several suckers (*Catostomidae*) ranging from 25-55 cm were found along Mission Creek when surveying for steelhead. Resident fish redds and smaller, probably resident rainbow trout were seen during these surveys, but were not included in redd or fish data.

Discussion

Snowpack for the Wenatchee Basin during the winter of 2007/2008 was substantially higher than that seen in 2006/2007 according to the Northwest Weather and Avalanche Center (NWAC). According to the Northwest Weather and Avalanche Center (NWAC), snowpack data for 2007/2008 at Stevens Pass, along the Cascade crest shows that there was a maximum depth of 148 inches (recorded by Washington Department of Transportation). Due to cool temperatures, much of the snowpack remained into early spring and may have contributed to late snow melt and cool water temperatures during the beginning of this year's steelhead surveys. Spawning was thought to have begun in mid-late March or later in most upper basin streams.

The lower Mission Creek drainage is known to host steelhead spawning. Steelhead and steelhead redd data was collected by the U.S. Forest Service from this drainage beginning in 2004. During surveys conducted in 2008, steelhead activity was observed in one reach in Mission Creek. The Mission Creek watershed enters the Wenatchee River subbasin closer to the confluence with Columbia than all other major tributaries surveyed in 2008. Mission Creek is considered important for the spatial diversity portion of the Viable Salmonid Population (VSP) index for steelhead recovery in the Wenatchee. Few of the tributaries within this drainage have been systematically and repeatedly surveyed by USFS. Many of these smaller streams in Mission Creek are intermittent and are not suitable for steelhead spawning even at peak flows.

Peshastin Creek which empties into the Wenatchee lower than all other streams surveyed in 2008, except Mission Creek, was also found to have steelhead activity in 2008. One dead hatchery steelhead was found at approximately 34 inches in length, at approximately 5 miles upstream from the Wenatchee River confluence with Peshastin Creek.

Upper boundaries to steelhead anadromy for Mission Creek and Peshastin Creek has not been systematically explored. Further investigation of steelhead distribution in these two watersheds would provide a greater understanding of steelhead use in the lower Wenatchee River.

The randomized surveys used for this study have several distinct advantages versus surveying index reaches. Sites randomly selected above or below recognized steelhead use areas help confirm the presence or absence of steelhead outside of known areas. Secondly, index reach areas incorporate much of the larger bodied water, where the majority of spawning occurs. Index reach surveys neglect to identify smaller tributary utilization. Upper and lower limits of spawning grounds can be better evaluated when performing random surveys that may include these overlooked areas when surveying only index reaches. Data from index reaches cannot be used to help estimate total steelhead spawning in the rest of the subbasin.

Surveys performed in Mission Creek this year further illustrate spawning use of steelhead in areas of the Wenatchee River basin with potential challenges. Future ISEMP surveys and analysis should lend help to developing a management strategy to maintain healthy steelhead populations in this system.

2008 Wenatchee Basin Snorkel Surveys

SNORKELING AND ELECTROFISHING

Abstract

Snorkel and electrofish surveys were performed in the Wenatchee subbasin during the summer of 2008 by U.S. Forest Service(USFS) in collaboration with Yakama Nation Fisheries and Terraqua Inc. Fish abundance and distribution was summarized by gathering fish lengths, species composition, and fish counts from thirty-four status and trend surveys sites. A subset of these status and trend sites were additionally surveyed for temporal and crew variability. Crew variability was further parsed into within crew and between crew variance. Sites that were too shallow to snorkel were electrofished and additional fish weight measurements were collected. Species richness and composition were analyzed by stream order. Median number of taxa was found to increase as stream order increased. The number of streams found to have a single fish species was found to decrease as stream order increased.

Project Area

The Wenatchee River was selected as a pilot subbasin in which ISEMP has initiated a Columbia Basin-wide approach to monitoring fish populations. Included under these different work elements are status and trend snorkeling surveys which have been performed since 2004 by USFS and have included data from headwater streams to mainstem Wenatchee River sites.

Fish abundance and distribution data were collected within the Wenatchee River subbasin in many of its fish bearing tributaries. Major tributaries of the mainstem Wenatchee River include Mission Creek, Peshastin Creek, Chumstick Creek, Chiwaukum Creek, Icicle Creek, Nason Creek, Chiwawa River, Little Wenatchee River, and White River. Sites were selected independent of private or public land ownership. Resident, migratory and anadromous fish occupy all of the major tributary streams within this watershed.

Methods and Materials

The sitelist created for 2008 was composed of 34 survey locations including sites that have not been previously visited and sites that are visited annually. Each site visited was surveyed by direct underwater observation using single-pass snorkeling (Thurrow 1994, Murdoch 2007). Site selection was determined from a rotating panel among other protocols detailed in: *Monitoring Strategy for the Upper Columbia Basin: Draft Report* (Hillman 2004).

In 2008, site selection for the variability study component was determined preseason by the Department of Ecology (DOE), Yakama Nation, and U.S. Forest Service fish and habitat crews. Variability study sites were selected first from annual panel sites and then from rotating panel sites when all the annual panel sites that were blocknettable were used. The DOE

performed habitat surveys at each site prior to any snorkeling/electrofishing. Most snorkeling and electrofishing surveys were closely coordinated with DOE and were completed within ten days of habitat surveys in order to minimize potential changes in habitat over time. All surveys occurred during the low flow period of July 1st - September 30th, 2008.

Survey length for each site was determined using bankfull width measurements from each stream that were collected by DOE. Bankfull width was multiplied by 20 to give the reach length for each site. Minimum site length was 150 meters and maximum site length was 500 meters.

In larger streams, up to ten snorkelers were required to effectively survey the channel. Each survey was completed in an upstream direction except in cases where flows were deemed too swift and/or dangerous. These sections were either snorkeled downstream or omitted entirely and the area of that section was measured and recorded. Distance between snorkelers was sufficient to clearly survey all parts of the stream. An estimate of underwater visible distance was also recorded using a '*Rapala*, Rainbow Trout (353)' lure. The distance underwater at which the lure could be identified as a fish was recorded. Three turbidity readings were also gathered at every snorkel survey. Fish counts for snorkeling were totaled for the entire reach by snorkeler and fish species by categories. For further details can be found in A Field Manual of Scientific Protocols for Underwater Observations within the Upper Columbia Monitoring Strategy (Murdoch et al. 2007).

Snorkeling was used unless the selected reach was too shallow to submerge a snorkel mask, in which case the site was electrofished. Sites that were electrofished were surveyed upstream using multi-pass removal technique. When electrofishing a site, weight was recorded in addition to species type and length for each fish individual. Conductivity was also collected at sites that were electrofished. Begin and end time, and water temperature were collected during every survey in 2008.

Variability Study

In 2008, fourteen survey sites were selected to be used in a snorkel variability study. The objective of the study was to estimate variability in snorkel counts due to time of day and different snorkeler effects according to methods described in Larsen et al. (2004). Temporal variation was observed by repeat sampling with the same crew over time. Crew variation was separated into 'within crew' and 'between crew' variance. Sites were selected from the Trend panel sitelist that were thought to be wide enough to fit up to four snorkelers spanning the width of the channel, but were narrow enough to block-net. Three crews were to complete the variability sampling design using a random assignment. Crews were randomly assigned to each site to complete three surveys in one daylight period for each of the fourteen variability sites. At each variability site, block nets were setup at the top and bottom of the reach, creating a closed system. The eventual goal was to snorkel each site three times with mixed crews and different assignments of snorkel lanes.

Results

A total of 962 fish were captured by electrofishing and 12,453 fish were observed while snorkeling. A summary of observations by stream order are shown below in Table 1. Unknown fish species or fish that could not be identified to the species level were not summarized as different taxa and were omitted from Table 1. Seven sites were found to be dry and were presumed to have no fish.

Table 1. 2008 Wenatchee Basin Snorkeling and Electrofish Survey Observations Summarized by Stream Order.

<u>Order</u>	<u># Sites</u>	<u>Median Water Temp C</u>	<u>Range in Water Temp C</u>	<u>Median # Species per Site</u>	<u>Range of Taxa per Site</u>	<u>% Single-species Sites</u>	<u>Species Present</u>	<u>Comments</u>
1	6	10.8	8.6-12.3	1	1-2	50	Rainbow trout, Cutthroat trout	Cutthroat were observed at all fish bearing 1 st order sites. Rainbow trout were present at 3 sites.
2	11	10.9	8.1-15.9	2	1-4	27	Rainbow trout, Cutthroat trout, Brook trout, Bull trout, Chinook, Sculpin, Coho	Rainbow trout were observed at all 2 nd order sites. Bull trout were found at 2 sites. Coho, Chinook and Brook trout were each seen at only one site.
3	8	10.75	8-18.8	3	1-6	12.5	Rainbow trout, Cutthroat trout, Brook trout, Bull trout, Chinook, Sculpin, Coho, Whitefish	Bull trout, Brook trout and cutthroat trout were found at 3 sites each. Chinook, Coho, and whitefish were each found at 2 sites. Rainbow trout were found at all 3 rd order streams.
4	8	12.5	9.5-16.9	4.5	3-8	0	Rainbow trout, Cutthroat trout, Brook trout, Bull trout, Chinook, Sculpin, Coho, Whitefish, Sockeye, Dace, Suckers	Chinook and sculpin were found at all sites. Rainbow trout and whitefish were found at all sites but one each. Sockeye, cutthroat trout, brook trout, dace and suckers were each found at 1 site. Bull trout and Coho were found at 3 sites each.
5	1	15.1	14.7-15.5	8	8	0	Rainbow trout, Chinook, Sculpin, Whitefish, Dace, Suckers, Pikeminnow	Only one 5 th order site was surveyed in 2008.

As shown in Table 1, median number of species was found to increase as stream order increased. The number of streams found to have a single fish species was found to decrease as stream order increased.

First Order streams

A total of six 1st order sites were surveyed in 2008, five that were fish bearing and one site with no fish. First order streams contained cutthroat trout at every site surveyed this year. Rainbow trout were the only other species observed in 1st order sites. Rainbow trout were found in Twin Creek site WEN-67 and Marble Creek site WC-15. Of streams that were fish bearing, 60% contained 1 taxa and 40% contained 2 taxa. Most 1st order streams were electrofished due to shallow stream depths. Examples of 1st order streams included: Elder Creek, Twin Creek, Marble Creek and Snowy Creek.

Second Order streams

All 2nd order streams contained rainbow trout. Cutthroat trout were the second most prevalent species and were found at five of the eleven 2nd order streams in 2008. Bull trout and sculpin were observed at two sites each. Chinook, Coho, and brook trout were seen in one site each. One 2nd order stream was found to have no fish. Beaver Creek, site WC-48 was the only 2nd order stream that was found to have Chinook, Coho, and brook trout. Two sites on Tronsen Creek (WC-29 and WC-152) and one site on Middle Shaser Creek (WEN-557) only had rainbow trout present.

Third Order streams

Napeequa River WC-16 was omitted from data summaries due to extremely poor visibility from glacial melt, thereby giving seven 3rd order sites with adequate visibility data. All seven 3rd order streams contained rainbow trout. Cutthroat trout, brook trout, bull trout, and sculpin were each seen in three of the seven 3rd order sites surveyed. Chinook, Coho and whitefish were seen at two sites. East Fork Mission Creek had rainbow trout and brook trout only. Jack Creek contained only rainbow trout at this survey location but bull trout are known to exist further downstream. Other 3rd order streams included: East Fork Mission Creek, Chumstick Creek, Peshastin Creek and Chiwawa River.

Fourth Order streams

Chinook and sculpin were found in all eight 4th order streams. Rainbow trout and whitefish were observed at all 4th order streams, but one site each. Icicle Creek mouth site WC-18 was found to have the greatest species richness with eight different species of fish. Site WC-18 was located at the confluence of the Wenatchee River. Bull trout and Coho were observed in

three 4th order sites. Cutthroat, dace, sockeye, brook trout and suckers were seen only one site each. . No brook trout were observed in fourth order streams. All fourth order streams were snorkeled only. Other 4th order streams included: Nason Creek, mid Chiwawa River, lower Icicle Creek, and lower Peshastin Creek.

Fifth Order streams

Although the stream order that showed the greatest species richness was 4th order streams, there was only one 5th order site surveyed in 2008 snorkeling surveys. The Wenatchee River, WC-21 was the only 5th order stream surveyed. Had there been more 5th order sites, we would assume species richness to be greatest in this stream order. Our 5th order stream contained rainbow trout, Chinook, pikeminnow, dace, suckers, whitefish, and sculpin. Pikeminnow were only seen in this stream. In the deepest sections of this reach, the bottom of the stream could not be seen due to poor water clarity and may have contributed to less fish observed in this deeper section. Water depth for this annual site was notably deeper than previous year's surveys. No cutthroat trout, Coho, brook trout, bull trout or sockeye were observed in this reach in 2008.

Discussion

A total of 13,415 fish were observed between electrofishing and snorkeling in 2008. Rainbow trout were observed at more sites than any other fish species. Fish that could not be positively identified were called "unknown" and totaled at 291 individuals; 200 of these unknown fish were found in site WC-18 Icicle Creek and were measured at 1 cm in length, making positive species identification difficult at this life stage. Table 2 below shows species counts.

Table 2. Fish species counts for snorkeling and electrofishing surveys in 2008.

<u>Species</u>	<u>Count</u>
Steelhead	8033
Chinook	1758
Coho	1140
Whitefish	832
Cutthroat	586
Sculpin	353
Bull Trout	162
Brook Trout	137
Sucker	76
Dace	42
Pikeminnow	3
Sockeye	2

Annual sites WC-26 Trout Creek and WC-6 French Creek were not surveyed in 2008 due to a major landslide on Icicle Road. The road is undergoing reconstruction and is assumed to be repaired for future surveys in the Upper Icicle Creek.

During snorkel surveys performed earlier in 2005 and 2006, day and night snorkeling surveys were conducted. Beginning in 2007 and also in 2008, only day snorkeling surveys were employed as an amendment to contractual terms. In addition, all habitat data collected prior to snorkeling/electrofishing was collected by the Washington Department of Ecology.

A new visibility method began in 2007 snorkel surveys in an attempt to relate underwater sight distance to turbidity measurements collected from water samples. This was done by drifting a standardized *Rapala* brand fishing lure and determining the distance at which the lure could be recognized as a fish. When gathering this measurement, we often found that the distance at which the lure could be recognized as a fish was limited by the length or width of the pool from which we tried to gather this measurement. Many of our streams were narrow and contained falls, boulders and/or debris that inhibited us from gathering a measurement that effectively represented the true distance of underwater visibility. Comments were needed to explain the limitations of this measurement gathered at those sites. In these cases, visibility distance data was recorded in our data summaries as -9.9m.

Future ISEMP surveys are to be performed in the Wenatchee subbasin under these now standardized methods for steelhead redd surveys and snorkeling surveys. Further analyses of these data on a watershed scale will be used to improve areas where salmonid populations are most heavily impacted. Cooperation from various interest groups and stakeholders will be an essential part of making significant changes on the ground. These data are meant to serve as a contribution of fisheries data for the long-term management of Pacific Northwest salmonids.

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