

# **STEELHEAD SURVEYS IN OMAK CREEK**

**2004 Report**

**Prepared by**

**John Arterburn  
&  
Christopher Fisher**

**Colville Confederated Tribes  
Fish and Wildlife Department  
P.O. Box 150  
Nespelem, WA 99155**

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## ***Executive summary***

Adult enumeration and redd and canopy cover surveys were conducted in 2004 on Omak Creek, located in north central Washington, within the Columbia Cascade Province, a tributary to the Okanogan River. Due to below average runoff the picket-weir trap was able to be secured for the duration of the steelhead spawning migration. A total of 104 steelhead returned to Omak Creek. Canopy cover increased nearly four fold since 2000, with increases of nearly 10% in the past year. however from 2004 increases are minimal but likely due to the installation of instream (bank stability) structures that in the short-term reduced the amount of riparian vegetation. Flows were greatly reduced during 2004, based upon a below average snow pack (62% of average), resulting in the lower 0.5 mile of Omak Creek becoming dry on July 25<sup>th</sup>. During 2004, high temperatures and below normal flows created harsh environmental conditions in Omak Creek, particularly for juvenile salmonid survival. Continued habitat rehabilitation efforts and the development of a locally-adapted broodstock will likely strengthen the summer steelhead population in Omak Creek when less than favorable environmental conditions exist. This information will likely be valuable when reestablishing summer steelhead in other tributaries of Okanogan River.

## *Table of Contents*

Executive summary.....	2
Introduction.....	4
Site selection.....	4
Methods.....	5
Results.....	6
Discussion.....	13
ACKNOWLEDGEMENTS.....	15
LITERATURE CITED.....	15

## ***Introduction***

Omak Creek is located in Okanogan County, Washington, and is wholly contained within the reservation of the Colville Confederated Tribes. The Omak Creek watershed has cultural significance to the twelve Colville Confederated Tribal Bands. Omak Creek is a common cultural-use area for activities such as resource gathering, berry picking, ceremonial sweating, education, picnicking and fishing. Fishing was important in Omak Creek since evidence of fish drying racks and nets were apparent in early photographs. Due to barriers, mid-stream reaches have been inaccessible by anadromous fish and land management practices within the watershed have reduced the quality of fish spawning habitat. Therefore, anadromous stocks have virtually been non-existent in Omak Creek since the early 1900's.

This project is, in part, to strengthen anadromous fish populations, particularly summer steelhead (listed as endangered), in the upper Columbia River Basin. Omak Creek was surveyed in 1992 by personnel of the CCT-Fish and Wildlife Department. The collected information estimated and described the physical condition of the in-stream habitats from the confluence of the Okanogan River upstream 12.2 miles (TFW Ambient Monitoring Stream Segment Summary 1992). The results of the survey indicated the habitat is in marginal condition, with most of the reaches evaluated for spawning habitat being embedded (Hanson 1992). Canopy closure exceeded 50% (57%) at only one of the four reaches surveyed. Consequently, water temperatures have been measured greater than 75°F (lethal for juvenile steelhead) during 1997 and 1998 (CCT, Fish and Wildlife, unpublished data).

Since the mid-1990's the efforts to restore the anadromous fisheries resource, particularly steelhead, in Omak Creek has been extensive and funded through a variety of sources. Actions have included road decommissioning, riparian vegetation planting, removal of fish passage barriers, channel restoration, and construction of fences to reduce impacts caused by livestock. To assess the success of habitat improvements, particularly channel reconfiguration (RM 0.5 to 1.0) and improved bank stability (RM 2.9 to 4.6), and develop baseline responses of steelhead production in Omak Creek, adult enumeration redd, and canopy closure surveys were conducted during the spring of 2004. This information will provide a baseline to assess the increase production associated with improved fish passage conditions at Mission Falls.

## ***Site selection***

Omak Creek is approximately 22 miles long. At RM 5.1 a natural falls impedes fish migration for steelhead and is a complete barrier to spring chinook salmon. To ensure consistent comparisons and trends of redd and fry abundance across years, which could be influenced by accessibility at and above the falls (i.e. flow conditions would change passage conditions), surveys were conducted downstream of the falls. Redd

surveys were conducted in two reaches (RM 0.5 to 1.0; RM 2.9 to RM 4.6). The lowermost reach is where extensive channel modification (floodplain creation, removal of ~ 60,000 cubic yards of material, etc.) has occurred during the fall and winter of 2002/03. The upstream reach lies within Tribal Trust property and during January 2003 in-stream structures were installed to improve bank stability, reduce the accelerated erosion, decrease the amount of fine sediment delivered to the stream channel, and reestablish riparian vegetation.

On July 20, 2003 a wild fire located near Mission Falls occurred burning 459 acres and fire retardant was dropped into Omak Creek at RM 5.5. A complete investigation of fish killed identified approximately 9,053 juveniles were killed. A complete fish kill occurred in the lower section of Omak Creek (RM 0-1.0) with a particle kill occurring upstream. A complete investigation on the impact to Omak Creek steelhead was prepared by Colville Tribe and Entrix, Inc. fish biologists (Fisher et al. 2003). Impacts from the August 2001 wild land fire that burned 8,112 acres (~9%) within Omak Creek Watershed are still affecting results. During the 2001 fire suppression activities, an inadvertent aerial drop of fire retardant completely killed fish from RM 8.0 to 2.9 partial kill fish RM 2.9 to the mouth.

## ***Methods***

Adult enumeration was conducted using a picket-weir trap located at approximately 0.1 mile of Omak Creek. The picket weir trap consisted of five 3-foot wide tripods that were filled with pickets and one trap with a funnel gate that measured 8' long x 4' wide x 4' deep. The trap was anchored by chain to a log that spanned the entire creek upstream of the trap location. The trap was checked for fish twice daily when in operation. All adult fish were identified for sex, origin (hatchery or naturally-produced), and a tissue sample was collected from the anal fin for genetics. In addition 16 adult steelhead (8 females, 8 males) were removed and transported to Cassimar Bar Hatchery to be used for the development of a locally-adapted broodstock.

A redd surveys were conducted on foot on May 5 and 6, 2004. Redd surveys were conducted walking upstream. Physical habitat was recorded if observed within 1 meter of the redd's edge. Physical habitat categories include: none, large wood debris (LWD minimum = 3 in. diameter, 6 ft. long), canopy, and undercut stream bank. A Global Position System (GPS) recorder was used to assess the spatial distribution of redds within the sample reaches.

Snorkel surveys were conducted by two CCT- Fish and Wildlife biologists during October 4, 5, 6, 2004. Snorkel surveys were conducted in an upstream direction by one snorkeler per reach (Thurow 1994). Snorkel survey reaches were 100 m in length. Each sample reach was separated by 100 m. Surveyed reaches began from ~ RM 0.5 to 1.0 (beginning on the upstream side of HWY 155 bridge), with a total of 500-m snorkeled within a 1,000 m reach, from ~ RM 2.9 to 4.6, within two 1,000 m reaches a total of 1,000 m were snorkeled and from ~ RM 15.2 to 15.6 (beginning downstream of the confluence of Stapaloo Creek), a total of 500-m was snorkeled within a 1,000 m reach.

Canopy closure was estimated by walking the stream from river mile 2.9 to 4.6 and using a convex densitometer (Platt's 1983). Data was collected at 20-transects and readings were taken at 4 locations along each transect. The 4 location values were

averaged to determine canopy closure at each transect and all transects were averaged to get a comparative value for data collected during 2000.

## **Results**

Adult enumeration at the picket-weir occurred from March 10 to April 30, 2004. One hundred four adult steelhead were collected along with 2 out-migrating steelhead smolts (Table 3). A redesigned (lighter, more stable) picket-weir trap was used and remained in place throughout the migration period. However, flows were greatly reduced compared to a typical year (2003 instantaneous peak flow 227 cfs, 2004 instantaneous peak flow 50 cfs) and was a factor in completing intercepting the adult return to Omak Creek. Fish were collected most commonly on the ascending limb of the hydrograph but it is unknown how many fish went upstream during high flows when the weir was disabled.

The density of steelhead redds located in the upper reach (14 redds) was substantially lower than the two previous years (Table 1). Prior to the redd survey a total of 104 steelhead were collected at the trap site located just upstream of the mouth. A total of 17 steelhead were collected for broodstock and the remaining steelhead were released directly upstream of the trap. Of the 14 redds, 4 were associated with canopy cover, 1 with large wood and 2 with undercut stream bank. The remaining 7 redds were not associated with any physical habitat as described by this survey.

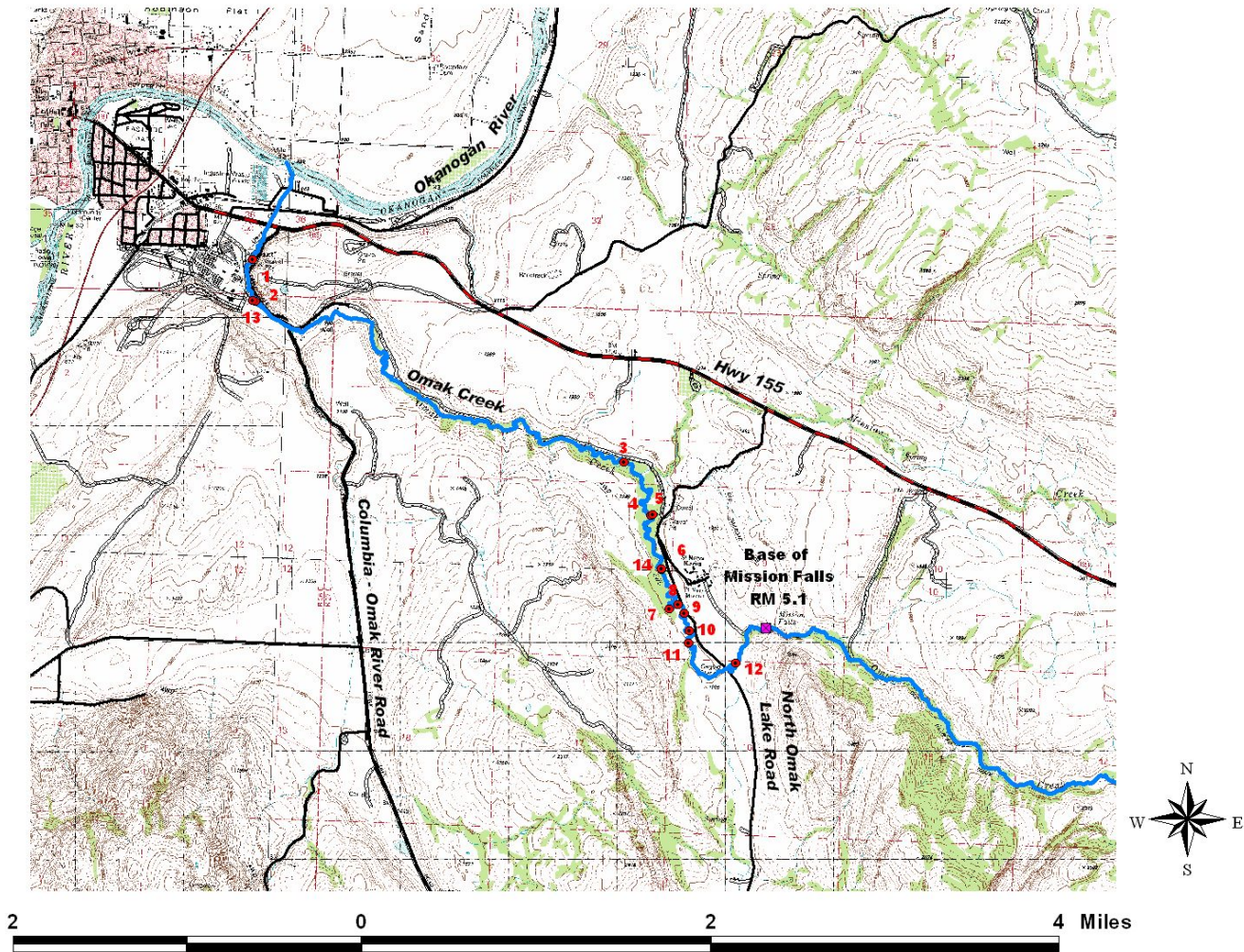
Snorkel surveys were conducted on October 4, 5, 6, 2004. Water temperature ranged from 48°F to 50°F. Snorkel surveys were conducted in Omak Creek in reference reaches and upstream of Mission Falls at the confluence of Stapaloo Creek. Snorkel surveys within reference reaches indicated *Oncorhynchus mykiss* was the most abundant species. However, densities of fry were substantially less at 0.135 rainbow trout per meter than observed in previous years, 2003, 1.8 rainbow trout per meter; 2002, 2.14 rainbow trout per meter. Again rainbow trout was the most abundant species (362) in the proximity of Stapaloo Creek however eastern brook trout (254) was present in substantial numbers.

Canopy closure was measured on July 15, 2004. The estimates of canopy closure for the upper reach (river mile 2.9-4.6) ranged from 3% to 72%. The average canopy closure for the upper reach in 2004 was 39.8.0% compared to a 10.3% estimate when data was collected in 2000 (Table 2). Canopy increase between 2003 and 2004 exceeded 22% and may have been reduced due to the influence by beaver activity in the lower reach. Even so, canopy closure continues to increase substantially.

Adult enumeration at the picket weir site occurred from March 15, 2003 to April 23, 2003. Nine adult fish were collected along with 2 out-migrating steelhead smolts and 3 out-migration spring Chinook smolts (Table 3). The picket weir trap was problematic at flows over approximately 80 cfs the weir would wash out and it was difficult to rebuild until flows were below 50 cfs. Fish were collected most commonly on the ascending limb of the hydrograph but it is unknown how many fish went upstream during high flows when the weir was disabled.

**Table 1.** Redd survey in Omak Creek during May 2004.

<b>Date</b>	<b>Reach (RM)</b>	<b>Redd #</b>	<b>Physical habitat</b>
<b>5/5/04</b>	<b>0.5 to 1.0</b>	<b>1</b>	<b>none</b>
<b>5/5/04</b>	<b>0.5 to 1.0</b>	<b>2</b>	<b>Undercut bank</b>
<b>5/5/04</b>	<b>0.5 to 1.0</b>	<b>3</b>	<b>Undercut bank</b>
<b>5/6/04</b>	<b>2.9 to 4.6</b>	<b>4</b>	<b>canopy</b>
<b>5/6/04</b>	<b>2.9 to 4.6</b>	<b>5</b>	<b>Large woody debris</b>
<b>5/6/04</b>	<b>2.9 to 4.6</b>	<b>6</b>	<b>none</b>
<b>5/6/04</b>	<b>2.9 to 4.6</b>	<b>7</b>	<b>none</b>
<b>5/6/04</b>	<b>2.9 to 4.6</b>	<b>8</b>	<b>none</b>
<b>5/10/04</b>	<b>2.9 to 4.6</b>	<b>9</b>	<b>none</b>
<b>5/10/04</b>	<b>2.9 to 4.6</b>	<b>10</b>	<b>canopy</b>
<b>5/10/04</b>	<b>2.9 to 4.6</b>	<b>11</b>	<b>canopy</b>
<b>5/10/04</b>	<b>2.9 to 4.6</b>	<b>12</b>	<b>canopy</b>
<b>5/10/04</b>	<b>2.9 to 4.6</b>	<b>13</b>	<b>none</b>
<b>5/10/04</b>	<b>2.9 to 4.6</b>	<b>14</b>	<b>none</b>



**Figure 1.** Distribution of steelhead redds in Omak Creek during May of 2004.

**Table 2.** Number of fish observed during snorkel surveys by species and stream reach for Omak Creek during October of 2004.

### Omak Creek Snorkel Survey 2004

Location	Reach	Length (m)	Number Observed								Unidentified fish	RBT Density (Fish/m)	Snorkelers initials
			RBT <100mm	RBT >100mm	Whitefish	SMB	Chinook	EBT	Sculpin	Sucker			
Mill	0-100	100	0	0	0	0	0	0	0	0	0	0	CF
Mill	200-300	100	0	0	0	0	0	0	0	0	0	0	CF
Mill	400-500	100	0	0	0	0	0	0	0	0	0	0	CF
Mill	600-700	100	0	0	0	0	0	0	0	0	0	0	CF
Mill	800-900	100	0	1	0	0	0	0	0	0	0	0.01	CF
<b>Lower Reach Average</b>			<b>0</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>.002</b>	
Moomaw	0-100	100	2	5	0	0	0	0	0	0	0	0.07	JA
Moomaw	200-300	100	0	0	0	0	0	0	0	0	1	0	CF



Moomaw 400-500	100	3	6	0	0	0	0	0	0	0	0	0.09	JA
Moomaw 600-700	100	0	17	0	0	0	0	0	0	0	1	0.17	CF
Moomaw 800-900	100	6	11	0	0	0	0	0	0	0	0	0.17	JA
<b>Lower Moomaw Average</b>		<b>2.2</b>	<b>7.8</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.4</b>	<b>0.10</b>	
Moomaw 1000-1100	100	0	11	0	0	0	0	0	0	0	0	0.11	CF
Moomaw 1200-1300	100	6	5	0	0	0	1	0	0	0	0	0.12	JA
Moomaw 1400-1500	100	0	18	0	0	0	0	0	2	1	1	0.21	CF
Moomaw 1600-1700	100	0	16	0	0	0	0	0	0	0	2	0.16	JA
Moomaw 1800-1900	100	9	16	0	0	0	0	0	0	0	1	0.26	CF
<b>Upper Moomaw Average</b>		<b>3</b>	<b>13.2</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.2</b>	<b>0.00</b>	<b>0.40</b>	<b>0.8</b>	<b>0.17</b>		
<b>Moomaw Reach Average</b>		<b>2.8</b>	<b>10.5</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.1</b>	<b>0.00</b>	<b>0.20</b>	<b>0.6</b>	<b>0.135</b>		
Total Fish Mill Reach		0	1	0	0	0	0	0	0	0	0		
Total Fish Moomaw Reach		26	105	0	0	0	1	0	0	6			

**Table 2a.** Number of fish observed during snorkel surveys by species and stream reach for upper Omak Creek during October of 2004.

## Omak Creek Snorkel Survey 2004

Number Observed

Location	Reach	Length (m)	RBT <100mm	RBT >100mm	Whitefish	SMB	Chinook	EBT	Sculpin	Sucker	Unidentified fish	RBT Density (Fish/m)	Snorkelers initials
Stapaloop Confluence	0-100	100	53	30	0	0	0	41	0	0	22	0.83	JA
Stapaloop Confluence	200-300	100	63	48	0	0	0	76	0	0	2	1.11	CF
Stapaloop Confluence	400-500	100	14	43	0	0	0	19	0	0	5	0.57	CF
Stapaloop Confluence	600-700	100	56	7	0	0	0	71	0	0	5	0.63	JA
Stapaloop Confluence	800-900	100	46	2	0	0	0	47	0	0	7	0.48	JA
<b>Stapaloop Confluence Average</b>			<b>46.4</b>	<b>26</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>50.8</b>	<b>0.00</b>	<b>0.00</b>	<b>1.00</b>	<b>0.72</b>	
Total Fish Stapaloop Confluence Reach			232	130	0	0	0	254	0	0	41		

Rainbow trout/ Steelhead = RBT

Eastern brook trout = EBT

**Table 3.** Comparison of transect data collected from 2000, 2003 and 2004 for estimated canopy closure from river mile 2.9-4.6 of Omak Creek.

Transect Number	2000 Canopy Closure Estimate (%)	2003 Canopy Closure Estimate (%)	2004 Canopy Closure Estimate (%)
1	0	29.4	54
2		17.6	47
3		0	25
4	10.3	10.3	32
5		0	3
6		10.3	43
7		10.3	4
8	33.8	60.3	71
9		60.3	57

10			23.5	47
11	7.4		17.6	28
12			36.8	43
13			32.4	29
14			48.5	31
15	7.4		39.7	38
16			54.4	62
17			72.1	72
18	2.9		25	32
19			30.9	37
20			39.7	41
<b>Average</b>	<b>10.3</b>		<b>31.0</b>	<b>39.8</b>

**Table 4.** Data collected from picket weir trap located at RM 0.1 on Omak Creek during the spring of 2004.

Date	M /F	H/W	Tag	Temp (°F) am/pm	Flow (CFS)	Comments
3/10/04				36/42	9.35	0 Fish
3/11/04				34/41	8.54	0 Fish
3/12/04				36/41	8.32	0 Fish
3/13/04				35/41	8.97	0 Fish
3/14/04				38/42	8.09	0 Fish
3/15/04	F	H		37/41	8.79	0 Fish
3/16/04				35/46	8.43	0 Fish
3/17/04				39/46	9.99	0 Fish
3/18/04				42/48	12.1	0 Fish
3/19/04				/43	11.4	0 Fish
3/20/04				35/41	9.23	0 Fish
3/21/04				37/44	8.55	0 Fish
3/22/04				39/48	8.81	0 Fish
3/23/04				42/50	14.0	0 Fish
3/24/04				42/45	20.6	0 Fish
3/25/04				38/44	17.8	1 Fish escaped
3/26/04				40/46	24.3	0 Fish
3/27/04	M	H		42/48	24.9	3 Fish caught; 1 Fish escaped
3/27/04	F	H				
3/27/04	M	H				
3/28/04	M	H		38/47	19.9	1 Fish
3/29/04				38/49	17.3	0 Fish
3/30/04	M	H		42/47	22.2	
	M	H				
	F	H				
3/31/04	M	H			36.7	
	M	H				

	F	H				
4/01/04				38/47	24.9	0 Fish
4/02/04				37/47	20.0	0 fish
4/03/04				42/47	22.6	2 Fish escaped
4/04/04	M	H		42/50	25.3	2 Fish
	M	H				
4/05/04	M	H		48/51	34.9	13 Fish
	M	W				
	M	H				
	F	H				
	F	H				
	M	H				
	M	H				
	F	H				
	M	H				
	F	H				
	F	H				
	M	H				
	F	H				
4/06/04	M	H		42/51	38.8	5 Fish
	M	W				
	M	H				
	M	H				
	M	H				
4/07/04	M	H		/53	41.0	10 fish – 1 smolt escaped
	M	H				
	M	H				
	M	H				
	F	H				
	M	H				
	M	H				
	M	H				
	F	H				
	M	H				
4/08/04	M	H		44/51	42.1	7 Fish
	F	H				
	M	H				
	F	H				
	F	H				
	M	H				
	M	H				
4/09/04	M	H		42/50	35.9	6 Fish; 1 adult mountain whitefish
	M	H				
	M	H				
	M	H				

	M	H				
	M	H				
4/10/04	M	H		/50		3 Fish
	F	H				
	F	H				
4/11/04	M	H		45/55	29.9	6 Fish
4/12/04	F	H		44/51	28.2	
	F	H				
	M	H				
	F	H				
	M	H				
	M	H				
4/13/04	F	H		47/54	28.7	9 Fish; 1 sucker
	F	H				
	M	W				
	F	H				
	M	H				
	M	H				
	M	H				
	M	H				
	F	H				
4/14/04	M	H		48/51	27.0	5 Fish
	M	W				
	M	H				
	M	H				
	F	H				
4/15/04	M	H		42/48	22.9	6 Fish
	F	H				
	F	H				
	M	H				
	M	W				
	M	H				
4/16/04	M	H		44/50	19.9	5 Fish
	F	H				
	F	W				
	M	H				
	M	H				
4/17/04	M	W		43/50	18.3	2 Fish
	M	W				
4/18/04	F	H		43/50	101	1 Fish
4/19/04	M	H		42/49		1 Fish
4/20/04				46/50		0 Fish
4/21/04	M	H		/50		6 Fish
	M	H				
	F	H				

	M	H				
	F	H				
	M	H				
4/22/04	M	H		43/53	116	1 Fish
4/23/04				48/52		0 Fish
4/24/04				44/51		0 Fish
4/25/04				45/54		0 Fish
4/26/04				48/58		0 Fish – 2 smolts
4/27/04				51/55		0 Fish
4/28/04	M	H				5 Fish
	M	W				
	F	H				
	F	W				
	M	H				
4/29/04				46/57		0 Fish - 1 sucker
4/30/04				48/58		0 Fish – 1 sucker

## ***Discussion***

Due to low flow conditions and a redesigned picket-weir trap adult enumeration was complete for the entire migration period. This is the first time since efforts have been made to enumerate adult returns to Omak Creek that the complete run has been evaluated. Currently, permitting is underway to construct and install a permanent floating picket-weir trap located at RM 1.0 that will ensure consistent adult steelhead enumeration. This permanent weir is expected to be installed and functional prior to the 2005 adult migration in Omak Creek.

Hatchery-origin adult steelhead outnumbered naturally-produced adult steelhead by a rate of 9.4:1. Although it is likely that hatchery-origin steelhead would return in greater numbers than naturally-produced because of the large numbers of smolts annually (~15,000 to 20,000), returns during 2004 were likely more skewed as a result of large fish kills that occurred from fire retardant drops in 2001 and 2003. Consequently these retardant spills drastically reduced the naturally-produced steelhead that were rearing in the creek.

The number of redds observed were less than in previous years 21 and 39 in 2003 and 2002, respectively. This may be due to lower number of returning adults and a high proportion of males (68%). Redd surveys are a common method used to monitor and evaluate adult steelhead returns and to determine population level trends. To do trend analysis a baseline of data is needed to be collected, but these data need to be established over several consistent years. Again, due to large fish kills from fire retardant drops in both 2001 and 2003 the consistency has not been established. To offset these large losses of production while transitioning to a locally-adapted broodstock, steelhead smolts originating from the Wells Hatchery complex continue to be outplanted in Omak Creek. This spring 9,855 steelhead smolts were released into Omak Creek from the Wells Hatchery complex. In addition 3,450 locally-adapted steelhead smolts were released from the Cassimar Bar Hatchery. All of the locally-adapted steelhead and 60% of

steelhead smolts from the Wells Hatchery complex were tagged with Passive Integrated Transponders (PIT) to monitor survival throughout the life history of both groups of fish.

However, the abundance of redds surveyed during the past three years indicates that passage and spawning of returning steelhead is occurring. However, the spawning habitat appears to be underutilized in Omak Creek even in previous years when returns were estimated to be substantially greater. It is expected that through the development of a locally-adapted broodstock juvenile production and survival will increase and result in more adults returning and utilizing more of the available spawning habitat.

Due to three consecutive poor water years and abnormally low snow pack (62% of normal) the lower reach (~ 1.0 mile) of Omak Creek became dry (subsurface flow) on July 25, 2004. Stream flow existed upstream of a beaver dam, however, flow was not observed running over the dam. On August 4, 2004, dead juvenile steelhead were observed in isolated pools immediately downstream of the beaver dam. Consequently, due to these extreme environmental conditions (low flow, high water temperatures, etc), steelhead production in the surveyed lower reach (3 redds) was eliminated and survival in the watered reaches upstream may be poor.

Survival of juvenile salmonids was poor during 2004 as indicated by the dramatic reduction in rainbow trout abundance. In addition to the low number of redds observed (12), poor flow conditions (lower reach became dry on July 25, 2004) and increases in water temperature (maximum water temperature recorded 75.5°F) likely contributed to the low abundance of juvenile rainbow trout. It is expected that during extreme drought conditions similar to those that occurred in 2004, survival of juvenile steelhead in Omak Creek as well as most snowmelt driven tributaries on the east side of the Cascade Mountains will be reduced. In addition, consecutive years of low run-off have prevented high energy flows from washing out beaver dams. Consequently the number of decadent and active beaver dams have increased and have likely negatively affected salmonid production. Beaver dams obviously impede migration of adult steelhead, particularly during low flow, limiting the number of adults access to spawning habitat. In addition, the pool created by the dam inundates potential spawning habitat, resulting in less available habitat. Finally, the beaver pond receives more solar radiation than a free-flowing channel and often results in elevated stream temperatures resulting in increased mortality of juvenile steelhead. Thus low flows combined with the increased frequency of beaver dams, have created less suitable conditions for steelhead production in Omak Creek.

Even under extreme environmental conditions stream rehabilitation projects along Omak Creek are producing results. Since 2000, canopy cover has increased nearly four fold in the upper reach of Omak Creek. The increase in canopy should reduce warm water temperatures in the lower reach. However due to severe low flow conditions water temperatures likely remain extreme. Most of this canopy increase is the result of reduced grazing pressures along the riparian corridor and recovery of grass and shrub communities that remained. Additional plantings have been made in areas that were heavily impacted by years of poor land use practices and along the stream bank where instream structures were installed during the winter of 2003. In addition, beaver activity has increased and reduced the influence of canopy by creating beaver ponds and widening the active channel. Habitat recovery is a slow process. However, even though factors (installation of instream structures and beaver activity retarding canopy closure)

have likely attenuated recovery effects in the short-term, indication of rehabilitation have been substantial. Preliminary results indicate that habitat conditions and associated responses by endangered summer steelhead in Omak Creek is underway and similar rehabilitation efforts should be considered throughout the upper Columbia.

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