July 14, 2008

This project completion report details the biological monitoring aspect of OWEB Grant 206-241 which ended June 30, 2007 but had an extension to June 30, 2008. This report is therefore due August 30, 2008 to the OWEB board.

Exhibit B Reporting Requirements:

1. **See attached report for project background.**
2. **No volunteers were used for this project, although in-kind work was provided by BLM and ODFW.**
3. **Project partners included PUR, BLM, ODFW, Roseburg Resources, Seneca Jones Timber Company, and Lone Rock Timber Company.**
4. **See attached report and reports pending for materials/methods.**
5. **See attached report for results.**
6. **See attached report.**

OWEB Grant Number 206-241
Project Completion Report

Umpqua Basin Fish Production Monitoring

Prepared by: Holly Truemper, Samuel Moyers, Bill Jones

Oregon Department of Fish and Wildlife, Umpqua Watershed
4192 N. Umpqua Hwy.
Roseburg, OR 97470

July 14, 2008

Big Tom Folley Creek smolt trap

Introduction

While it is assumed that habitat enhancement and fish passage improvements increase fish production, there is little empirical data to support that claim in the Umpqua Basin. The Umpqua District has used smolt traps in the past to both establish a baseline record and to attempt to determine any response to habitat enhancement (Brush, Hinkle, and Big Tom Folley Creeks). Smolt trap data is very useful when combined with other fish survey methods. Brush Creek and Big Tom Folley were originally chosen as monitoring sites since they are similar in characteristics, and Brush was originally the treatment stream for restoration projects while Big Tom Folley was used as the control until later projects occurred.

Currently, there are PUR habitat enhancement projects scheduled to take place within the Little Wolf Creek and Wolf Creek basins. In order to gain more insight as to whether restoration efforts improve fish populations and address limiting factors, baseline and post treatment surveys will be needed. Restoration that is planned in Wolf and Little Wolf Creeks in 2008 and 2009 provides a unique opportunity to examine stream and fish responses to log-only and boulder-only instream placements. Pre-treatment data exists on these streams for smolt outmigration, summer habitat, spawning adults, summer seeding, channel cross-sections and temperature.

ODFW has been collecting smolt out-migration data at five sites in the Upper Umpqua and Elk Creek watersheds almost continuously for 15 years to monitor yearly trends and to calculate over-winter survival rates of coho and steelhead. This OWEB grant will add to this baseline data and provide funding to continue past monitoring and add new monitoring components. Continuous smolt trap data from Brush, Big Tom Folley, and Hinkle Creeks is important to future efforts to monitor watershed health. Extensive habitat enhancement and fish inventories have been completed within the Hinkle Creek, Brush Creek and Big Tom Folley Creek basins.

The Oregon Department of Fish and Wildlife (ODFW) Umpqua Watershed District joined with the Partnership for the Umpqua Rivers (PUR) in an effort to continue ongoing juvenile monitoring within the Umpqua Basin. Since little is known about stream-specific limiting factors and fish production response to various habitat restoration treatments such as log or boulder placement, these long term data sets will help to understand the fish response aspect related to or resulting from habitat restoration projects.

The goals of this partnership are to: 1) gather additional information regarding the anadromous salmonid response to various land management practices; 2) monitor juvenile trends in response to habitat enhancement work. To accomplish this, ODFW and PUR have been

conducting surveys that observe life history traits which include: smolt out-migration timing, size, age, condition of out-migrants, out-migrant population estimate, summer parr densities, habitat surveys, and adult spawning salmonid surveys.

Methods

Rotary Screw Traps

Site selection was based on access to streams to place traps, landowner permission, bedrock bottoms or chutes, pool depths greater than 2.5 feet, and stream gradients less than 2 percent (Table 1, Figure 1).

Table 1. 2007 Umpqua Fish District Rotary Screw Trap Locations and Operation Dates. T is township, R is range, and S is section. Trap locations are identified by quarter sections.

Trap Site	Location (T,R,S)	Operation Dates
Brush Creek	T22S R7W Sec 13 SW/SE	March-May
Hinkle Creek	T24S R3W Sec 31 SW/SW	March-May
Big Tom Folley	T22S R7W Sec 16 SE/NW	March-May

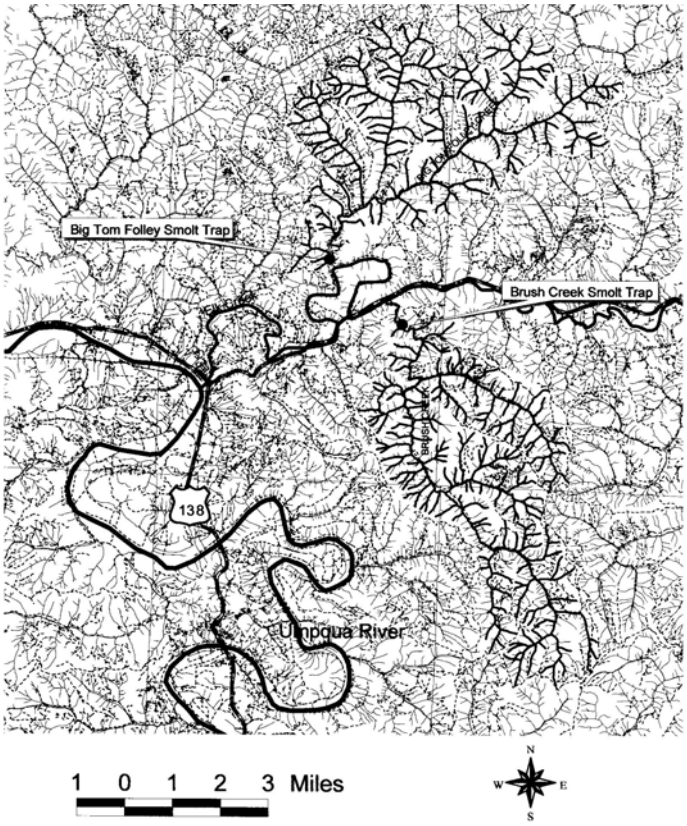

Figure 1. Map of smolt trap sites.

A five foot rotary trap that contains an Archimedes screw built into a screened cone suspended between two pontoons was placed at each site location (Figure 2). The large opening of the cone was placed upstream into stream flows so that water pressure forces the cone to turn on a shaft. Migrating fish enter the large end of the cone and are passed through the trap into a holding box at the back of the trap. Traps were secured using a system of cables and pulleys to allow easy adjustment of traps during fluctuating flow conditions. The traps were operated 24 hours a day, seven days a week and only were not operating if flows were high or debris was jamming the trap.

Figure 2. Brush Creek smolt trap and site.

Fish were removed from the holding box and placed in five-gallon buckets. A separate bucket was filled and MS-222 (Tricaine Methanesulfonate) or Alka-Seltzer was added to sedate captured fish. All fish were sedated, to reduce stress and ease handling, then identified, and counted. Salmonids were measured (fork length, mm) each time the trap was operated. During peak migration periods, only 25 salmonids of each species were measured per day, 100 per week, while the remaining fish were enumerated. All unmarked fish were released downstream of the trap. Nongame fish were also identified to species, counted, and released downstream.

Because the rotary trap does not sample 100 percent of the water column, only portions of the downstream juvenile migrants are captured. A variety of factors such as changing stream flows, changing fish size, and behavior and species composition can influence the total migrant population. To accurately estimate downstream juvenile migrants, trap efficiency must be measured on a regular basis. Other smolt trap studies recommend up to 25 fish of each age class

are marked and released each day (Jepsen et al. 2006). Typically not enough fish are captured to be marked on a daily basis thus a weekly estimate is calculated to estimate salmonid population.

To estimate trap efficiency, coho, chinook, and steelhead were marked using a top or bottom caudal fin clip. Marked salmonids were released at a minimum of 100 meters upstream of the trap and allowed to pass by the trap a second time. Recaptured salmonids were recorded and released downstream of the trap. Weekly estimates were calculated by expanding trap catches using the following formula:

$$\mathbf{N_i = (n_i)/ (m_r/m_{rl})}$$

Where N_i = weekly total number of migrants passing the trap

n_i = number of unmarked fish caught in the trap in week (Monday-Sunday)

m_r = number of marked fish recaptured in trap in week (Monday-Sunday)

m_{rl} = number of marked fish released above the trap in week (Monday-Thursday)

The total number of fish migrating past the trap site (N_{total}) for the season is the estimate of summing N_i for the season.

All marked fish were released within one hour after being marked and during daylight hours. Salmonids were divided into age classes based on fork lengths of fish measured at the time of capture. Criteria used to place fish into age classes were taken from data collected by ODFW on rotary traps in North Coast streams.

Table 2: Size classes for salmonids caught in rotary screw traps.

Species	Fork Length (mm)
Coho 0+	< 70
Coho 1+	> 70
CHF 0+	All fall Chinook are 0+
CHS 0+	< 80
CHS 1+	> 80
Trout fry	< 85
Stw & Ct 1+	85-165
Stw & Ct 2+	166-185
Stw & Ct 3+	> 185

Additional life history information was collected during the 2007 and 2008 trap operation. It is hypothesized that out-migrating salmonids in good physical condition will survive at a higher rate to become adults compared to large numbers of poor conditioned out-migrating smolts. Trap operators collected weight information using a portable scale. Weights were recorded in grams and combined with lengths to estimate an individual condition factor of coho smolts and out-migrating steelhead. Condition factors were calculated using the following formula:

$$K= (100 \times W)/ (L/10) ^3$$

K= Condition Factor

W= Weight in grams

L= Fork Length in millimeters

A new method of calculating a 95 percent confidence interval was used for the 2007 and 2008 smolt trap seasons. The old method used one calculation to find variance. Variance was found using the equation: $V= ((X^2)*(Y-Z))/ ((Y+1)*(Z+1))$. Where X= the number of estimated migrants, Y= number of new fish captured in the trap, Z=the number of recaptured fish caught in the trap and V= Variance. The confidence interval was determined by the equation: $CI= 1.96*(V)^{(1/2)}$. The new method uses Bootstrap, a program that uses multiple calculations to arrive at a variance and 95% C.I. (Thedinga et al. 1994). Bootstrap uses marked fish, trap efficiency, and estimated population to find the value. The program gives an option of the number of iterations and this study used 1000 iterations when using the program. The

confidence interval is then determined using the same equation as above CI= 1.96*((V) $^{(1/2)}$) except the Bootstrap variance is substituted into the equation.

Summer Snorkeling

Juvenile coho salmon seeding levels for 2007 were obtained using two different methods. Wolf Creek, Brush Creek, and Big Tom Folley were surveyed using 1,000 meter segments with a two-person crew following ODFW Corvallis Research Laboratory protocols (Jepsen and Rodgers 2004). The number of pools sampled in a 1000 meter segment between stream basins was highly variable and may be attributed to the many physical habitat factors.

Stream gradient, substrate composition, large wood complexity, stream order, and barriers were some of the physical habitat factors that determined the number of pools sampled in any given segment and stream basin. To reduce problems associated with snorkeling in shallow or fast water habitats, only pools ≥ 6 m^2 in surface area and at least 40 cm deep were snorkeled. A single upstream pass is made when snorkeling, and surveyors either alternate turns snorkeling or one surveyor snorkels an entire segment depending on the number of pools to be snorkeled. In rare cases both surveyors would snorkel a pool, usually because the pool was too large for one surveyor to effectively count. Once a pool was snorkeled, surveyors measured for the maximum depth, average width, and length of the pool in meters. All salmonid species were counted for each pool surveyed. Other resident fish, beaver activity, habitat enhancement, tributary junctions, and all other information relevant to the pool snorkeled was recorded. When possible, mass survey reach breaks were used in order to compare future seeding level surveys. A stream is considered fully seeded at 0.7 coho/m^2 and a calibration factor was used based on other studies in the Umpqua (Brick and Huchko 2006).

Winter Habitat

Winter habitat surveys were conducted for Wolf Creek extent of coho distribution in 2007 following ODFW Corvallis protocol (AIP 2007). Final report and results are expected by January 2009 due to staff turnover.

Spawning Surveys

Spawning salmon and steelhead surveys were conducted for Wolf Creek in 2007 to determine distribution and abundance of redds based on methods from OASIS project (OASIS 2007a, OASIS 2007b). Final report and results are expected by January 2009 due to staff turnover.

Results

Smolt Trapping

Brush Creek

Winter steelhead 1+, 2+, 3+, coho salmon smolts and all cutthroat were marked to determine trap efficiency, and to generate a population estimate for each size class. Table 3 displays salmonid species totals by week, with mark/recapture and mortality data excluded. The total number of coho salmon fry captured during 2007 trap operation was 3,999. Total coho salmon smolts captured were 1,774, with the peak (n=298) occurring in mid-April. Two trout fry were captured for the season. Of the older aged steelhead captured, 1+ were the most numerous. Three hundred and ninety seven 1+ steelhead, fifty two 2+ steelhead and two 3+ steelhead were captured during trap operation. A total of eighty-six cutthroat trout of various age classes were captured.

Table 3. 2007 Brush Creek Rotary Screw Trap Weekly Salmonid Captures.

Week	Co Fry	Co Smolt	STW 1+	STW 2+	STW 3+	CT
3/4-3/10	65	36	14	4	0	15
3/11-3/17	571	108	27	0	0	10
3/18-3/24	978	207	25	5	0	4
3/25-3/31	689	139	87	11	2	12
4/1-4/7	219	41	14	4	0	2
4/8-4/14	413	311	84	10	0	5
4/15-4/21	473	290	48	4	0	2
4/22-4/28	132	298	42	7	0	21
4/29-5/5	269	215	37	4	0	10
5/6-5/12	96	119	11	3	0	4
5/13-5/19	0	0	0	0	0	0
5/20-5/26	94	10	8	0	0	1
Season Total	3,999	1,774	397	52	2	86

Tables 4, 5 and 6 summarize steelhead, coho smolt and cutthroat mark/recapture data which includes the total fish captured, number marked, number recaptured, trap efficiency, and estimated number of migrants on a weekly basis. The season trap efficiency for winter steelhead was 0.54. The estimated number of steelhead out-migrants was 852. The estimated 95%

confidence interval for winter steelhead out-migrants was 99, which gives an out-migrant estimate ranging from 752 to 951. The season trap efficiency for coho smolts was 0.83 percent. The estimated number of coho salmon out-migrants was 2,086 with a confidence interval ± 115. This gives an out-migrant estimate ranging from 1,971 to 2,201. Cutthroat trap efficiency for the season was 0.37 which resulted in an out-migrant estimate of 218. The 95% confidence interval was calculated at ± 79 which gives an out-migrant estimate ranging from 139 to 297.

Table 4. 2007 Brush Creek Rotary Screw Trap Steelhead Out-Migrant Estimates.

Week	Number captured in trap (a)	Number of fish marked (b)	Number of marked recaps (c)	Estimate of trap efficiency (d)	Estimated number of migrants (e)	95% CI (+/-)	Bootstrap Variance
3/4-3/10	25	25	12	0.48	52		
3/11-3/17	22	20	15	0.75	29		
3/18-3/24	30	30	14	0.47	64		
3/25-3/31	103	100	42	0.42	245		
4/1-4/7	18	18	9	0.50	36		
4/8-4/14	94	46	25	0.54	173		
4/15-4/21	52	29	18	0.62	84		
4/22-4/28	50	28	21	0.75	67		
4/29-5/5	40	18	12	0.67	60		
5/6-5/12	14	6	3	0.50	28		
5/13-5/19	0	0	0	0.00	0		
5/20-5/26	8	7	4	0.57	14		
Season Total	456	327	175	0.54	852	98.71	2,694

Table 5. 2007 Brush Creek Rotary Screw Trap Coho Salmon Out-Migrant Estimates.

Week	Number captured in trap (a)	Number of fish marked (b)	Number of marked recaps (c)	Estimate of trap efficiency (d)	Estimated number of migrants (e)	95% CI (+/-)	Bootstrap Variance
3/4-3/10	56	56	35	0.63	90		
3/11-3/17	98	98	92	0.94	104		
3/18-3/24	207	207	150	0.72	286		
3/25-3/31	87	44	11	0.25	348		
4/1-4/7	41	26	0	0.83	49		
4/8-4/14	311	120	116	0.97	322		
4/15-4/21	290	82	74	0.90	321		
4/22-4/28	298	107	128	0.83	249		
4/29-5/5	215	86	83	0.97	223		
5/6-5/12	119	47	34	0.72	165		
5/13-5/19	0	0	0	0.00	0		
5/20-5/26	10	10	10	1.00	10		
Season Total	1,732	883	733	0.83	2,086	114.60	1,446

To gain a perspective of the smolt out-migration trends at a watershed level, migrants per stream meter has been calculated in the Brush Creek basin since 1995. To obtain migrants per meter, the total stream length of coho distribution in Brush Creek is divided by the estimated number of out-migrants. Tables 7 and 8 show the migrants per meter for both coho and steelhead. For 2007, coho out-migrant per meter of stream was 0.074, while steelhead out-migrants per meter of stream were 0.030. The 12 year average (no data was recorded for 2004) for coho is 0.143 coho out-migrants per meter of stream, and the 9 year average for steelhead (seasonal trap efficiency was not calculated for steelhead for the first 3 years of the study, so no out-migrants per meter were obtained for those years), is 0.024 steelhead out-migrants per meter of stream.

Table 6. 2007 Brush Creek Rotary Screw Trap Cutthroat Out-Migrant Estimates

Week	Number captured in trap (a)	Number of fish marked (b)	Number of marked recaps (c)	Estimate of trap efficiency (d)	Estimated number of migrants (e)	95% CI (+/-)	Bootstrap Variance
3/6-3/11	15	15	7	0.47	32		
3/12-3/17	10	10	5	0.50	20		
3/18-3/24	4	4	0	0.37	11		
3/25-3/31	12	12	3	0.25	48		
4/1-4/7	2	2	0	0.37	5		
4/8-4/14	5	2	1	0.50	10		
4/15-4/21	2	0	1	0.37	0		
4/22-4/28	21	9	5	0.56	38		
4/29-5/5	10	4	1	0.25	40		
5/6-5/12	4	3	0	0.37	11		
5/13-5/19	0	0	0	0.00	0		
5/20-5/26	1	1	0	0.37	3		
Season Totals	86	62	23	0.37	218	78.93	2,205

Weights for condition factors were collected 24 times for coho smolts, 17 times for steelhead and 8 for cutthroat during trapping operations. The season average condition factor for coho smolts was 1.107. Age classes of steelhead were not separated during data collection. The season average condition factor for all steelhead was 1.114. The season condition factor was 1.114 for cutthroat trout.

Table 7. Brush Creek Coho Smolt Migrants per Meter.

Year	Seasonal Trap Efficiency Est.	Number Captured	Estimated Migrants	Stream Length (m)	Migrants per meter
1995	0.261	1959	6694	28,200	0.237
1996	0.438	902	2344	28,200	0.083
1997	0.361	239	3274	28,200	0.116
1998	0.340	803	4502	28,200	0.160
1999	0.471	296	816	28,200	0.029
2000	0.518	1324	4980	28,200	0.177
2001	0.593	1451	2760	28,200	0.098
2002	0.528	1818	3495	28,200	0.124
2003	0.390	1171	3236	28,200	0.115
2004					
2005	0.582	5515	9508	28,200	0.337
2006	0.458	1306	4937	28,200	0.175
2007	0.837	1732	2086	28,200	0.074

Big Tom Folley

Table 9 displays salmonid species totals by week with mark/recapture and mortality data excluded. For the season a total of 1,741 coho salmon fry and 1,429 coho salmon smolts were captured. The peak of the coho smolt out-migration occurred in the week starting with April 8th and ending on April 14th. Steelhead numbers for the season were two hundred twenty seven 1+ fish, five 2+ fish and three 3+fish. Additionally, 316 trout fry were also captured. Only three steelhead smolt were identified during trap collection. A total of 96 cutthroat trout of the older age classes were captured. The trapping mortality for all salmonids was 1.68%.

Table 8. Brush Creek Steelhead Migrants per Meter for age classes 1+,2+,3+ combined for each year.

Year	Seasonal Trap Efficiency Est.	Number Captured	Estimated Migrants	Stream Length (m)	Migrants per meter
1995	0	34		28,200	
1996	0	44		28,200	
1997	0	8		28,200	
1998	0.276	383	1388	28,200	0.049
1999	0.305	113	353	28,200	0.013
2000	0.447	132	356	28,200	0.013
2001	0.488	258	702	28,200	0.025
2002	0.370	99	255	28,200	0.009
2003	0.221	105	373	28,200	0.013
2004					
2005	0.603	493	818	28,200	0.029
2006	0.225	122	943	28,200	0.033
2007	0.535	456	852	28,200	0.030

Tables 10, 11 and 12 summarize steelhead, coho smolt, and cutthroat mark and recapture data which includes estimates of the number of migrants on a weekly basis. The season trap efficiency on winter steelhead was 0.150. The estimated number of winter steelhead out-migrants was 2,170. A confidence interval could not be calculated for winter steelhead using the bootstrap method because all the fish caught in the trap were also marked. The season trap efficiency on coho smolts was 0.2977 percent. The estimated number of coho smolt out-migrants was 4,800 and the estimated 95% confidence interval was 515. Based on this the out-migrating population estimates for coho smolts ranged from 4,285 to 5,315. The seasonal trap efficiency for cutthroat was 1159. Using this trap efficiency, the out-migrant estimate for cutthroat in Big Tom Folley was 849.

Table 9. 2007 Big Tom Folley Rotary Screw Trap Weekly Salmonid Captures.

Date	Co Fry	Co Smolt	Trout fry	STW 1+	STW 2+	STW 3+	CT
3/2-3/3	13	1	0	0	0	0	0
3/4-3/11	56	33	0	8	0	0	4
3/12-3/17	218	29	0	13	0	1	5
3/18/-3/24	643	223	48	38	2	1	15
3/25-3/31	177	127	0	54	1	0	13
4/1-4/7	16	140	0	10	0	1	9
4/8-4/14	268	325	46	68	1	0	18
4/15-4/21	86	82	18	4	0	0	2
4/22-4/28	101	73	3	11	1	0	5
4/29-5/5	44	131	0	14	0	0	11
5/6-5/12	78	62	187	3	0	0	2
5/13-5/19	34	166	9	4	0	0	10
5/20-5/26	7	37	5	0	0	0	2
Total	1,741	1,429	316	227	5	3	96

Table 10. 2007 Big Tom Folley Rotary Screw Trap Steelhead Population Estimates.

Week	Number captured in trap (a)	Number of fish marked (b)	Number of marked recaps (c)	Estimate of trap efficiency (d)	Estimated number of migrants (e)
3/2-3/3	0	0	0	0.0000	0
3/4-3/11	9	9	0	0.1500	60
3/12-3/17	17	16	5	0.3125	54
3/18-3/24	42	43	14	0.3256	129
3/25-3/31	62	62	7	0.1129	549
4/1-4/7	51	49	6	0.1224	417
4/8-4/14	59	12	1	0.0833	708
4/15-4/21	4	3	0	0.1500	27
4/22-4/28	11	6	0	0.1500	73
4/29-5/5	16	14	0	0.1500	107
5/6-5/12	3	0	0	0.1500	20
5/13-5/19	6	5	0	0.1500	40
5/20-5/26	1	1	0	0.1500	7
Totals	281	220	33	0.1500	2,191

Trap operations have been continuous in Big Tom Folley since 1997 and during this time ODFW has been calculating out-migrants per meter to monitor trends and compare with Brush Creek. To obtain migrants per meter, the total stream length of coho distribution in Big Tom Folley was divided by the estimated number of migrants. Tables 13 and 14 show both coho and steelhead migrants per meter trends in Big Tom Folley. In 2007, Coho out-migrants per meter of stream were 0.134 while steelhead out-migrants per meter of stream were 0.061.

Table 11. 2007 Big Tom Folley Rotary Screw Trap Coho Out-Migrant Estimates

Week	Number captured in trap (a)	Number of fish marked (b)	Number of marked recaps (c)	Estimate of trap efficiency (d)	Estimated number of migrants (e)	95% CI (+/-)
3/2-3/3	1	1	0	0.2977	3	
3/4-3/11	33	32	2	0.0625	528	
3/12-3/17	29	29	12	0.4138	70	
3/18-3/24	223	223	161	0.7220	309	
3/25-3/31	127	102	22	0.2157	589	
4/1-4/7	140	74	5	0.0676	2072	
4/8-4/14	325	113	18	0.1593	2040	
4/15-4/21	82	45	13	0.2889	284	
4/22-4/28	73	58	2	0.0345	2117	
4/29-5/5	131	39	2	0.0513	2555	
5/6-5/12	62	43	9	0.2093	296	
5/13-5/19	166	117	22	0.1880	883	
5/20-5/26	37	31	2	0.0645	574	
Total	1,429	907	270	0.2977	4,800	515

Table 12. 2007 Big Tom Folley Rotary Screw Trap Cutthroat Out-Migrant Estimates.

Week	Number captured in trap (a)	Number of fish marked (b)	Number of marked recaps (c)	Estimate of trap efficiency (d)	Estimated number of migrants (e)
3/2-3/3	0	0	0	0.0000	0
3/4-3/11	4	4	0	0.1159	35
3/12-3/17	5	5	0	0.1159	43
3/18-3/24	15	15	1	0.0667	225
3/25-3/31	13	10	1	0.1000	130
4/1-4/7	9	8	1	0.1250	72
4/8-4/14	18	2	0	0.1159	155
4/15-4/21	2	2	0	0.1159	17
4/22-4/28	5	5	0	0.1159	43
4/29-5/5	11	7	1	0.1429	77
5/6-5/12	2	2	0	0.1159	17
5/13-5/19	10	7	4	0.5714	18
5/20-5/26	2	2	0	0.1159	17
Total	96	69	8	0.1159	849

Weights for condition factors were collected 33 days for coho smolts, 21 days for steelhead and 20 days for cutthroat during trapping operations. The season average condition factor for coho smolts was 1.090. Age classes of steelhead were not separated during data collection. The season average condition factor for all steelhead was 1.114 and for cutthroat it was 1.035.

2008 smolt traps were run from March through June for both Big Tom Folley and Brush Creek and results will be submitted in a later report.

Table 13. Coho Migrants per Meter in Big Tom Folley based on smolt trap estimates.

Year	Species	Age Class	Seasonal Trap Efficiency Est.	Number Captured	Estimated Migrants	Stream Length (m)	Migrants per meter
1997	Coho	Smolt	0.430	778	2826	35,772	0.079
1998	Coho	Smolt	0.296	338	1016	35,772	0.028
1999	Coho	Smolt	0.311	118	407	35,772	0.016
2000	Coho	Smolt	0.229	494	2637	35,772	0.074
2001	Coho	Smolt	0.348	1926	6636	35,772	0.186
2002	Coho	Smolt	0.182	399	2207	35,772	0.062
2003	Coho	Smolt	[redacted]			35,772	[redacted]
2004	Coho	Smolt				35,772	
2005	Coho	Smolt	0.428	5223	13803	35,772	0.386
2006	Coho	Smolt	0.272	1336	5163	35,772	0.144
2007	Coho	Smolt	0.2977	1429	4800	35,772	0.134

Table 14. Big Tom Folley Creek Steelhead Migrants per Meter

Year	Age Class	Seasonal Trap Efficiency Est.	Number Captured	Estimated Migrants	Stream Length (m)	Migrants per meter
1998	1+,2+,3+	0.242	47	150	35,772	0.004
1999	1+,2+,3+	0.067	28	330	35,772	0.013
2000	1+,2+,3+	0.122	254	1868	35,772	0.052
2001	1+,2+,3+	0.276	528	2503	35,772	0.070
2002	1+,2+,3+	0.118	96	697	35,772	0.019
2003	1+,2+,3+	[redacted]			35,772	[redacted]
2004	1+,2+,3+				35,772	
2005	1+,2+,3+	0.467	956	1972	35,772	0.055
2006	1+,2+,3+	0.0698	43	565	35,772	0.016
2007	1+,2+,3+	0.150	281	2170	35,772	0.061

Standing Crop Survey Results

Number of pools sampled and average density of coho salmon juveniles, was highly variable between snorkeled streams (Table 15).

Table 15. Streams surveyed, number of pools sampled for each stream, and average number of coho/m^2 of pool habitat for each stream for 2007.

Stream Name	Pools Sampled	Avg. coho per m^2
Brush Creek	52	0.440
Thistleburn	15	0.807
Big Tom Folley control	16	0.483
Big Tom Folley enhanced	18	0.310
N. Fk Tom Folley control	12	0.684
N. Fk Tom Folley enhanced	17	0.269

Discussion

Smolt Traps

This concludes the 12th year of trapping on Brush Creek. The trap was operated in 2007 from March 6th to May 25th. The coho salmon smolt out-migration peaked in mid April while the winter steelhead and cutthroat trout out-migration peaked in late March/early April. When compared to the previous 3 years the number of steelhead out-migrants has remained very stable. Coho salmon out-migrants, over this same time period, have shown a steady decline, with 2007 having the second lowest out-migrant per meter count in the history of Brush Creek trap operations. The reason for this decline is unknown at this time, especially with no spawning surveys having been completed in Brush Creek since 2005. The one anomaly within this 3 year period would be 2005 which was a drought winter so winter survival rates were very high. Condition factors for coho salmon smolts, winter steelhead and cutthroat trout at Brush Creek remain good indicating that out-migrants who survive the winter freshets are in very good condition as they start their migration to the ocean. The season average condition factor for coho salmon was 1.107 and the five year average is 1.139. The season average condition factor for winter steelhead was 1.114 and the five year average is 1.073.

This was the 9th year of trap operation in Big Tom Folley. The trap operated from March 2nd through June 6th 2007. Peak out-migration for all salmonids was the week of April 8-14.

Coho salmon smolts in Big Tom Folley have shown a decline from the 2005 season (drought winter with high survival and a record number of coho salmon smolts) but still remains above estimated counts calculated prior to restoration work beginning in the basin (2001). The number of coho salmon smolt out-migrants from 2007 (4,800) is nearly double the 6 year average (2,621) from 1997 through 2002.

The 2007 season's trap operations went relatively smooth. As with most years low flows continue to be a problem. At all the trap sites a large amount of sandbagging had to be completed to keep the traps operating throughout the smolt out-migration. At Brush Creek, a plywood flume was constructed into the mouth of the trap to keep it spinning during low flows. At Big Tom Folley, trap operators dammed up most of the creek to divert all flow to the trap and even dug out an area under the cone and live well to enhance operations.

Non-game fish species in all the smolt traps have remained constant over the past four years. Speckled Dace and Redside Shiner are the dominant nongame fish. Pacific Lamprey juveniles (ammocetes) were also numerous, with some Brook Lamprey and Pacific Lamprey adults being caught at Brush Creek and Big Tom Folley. Not much is known about the lamprey juveniles' downstream migration patterns.

Standing Crop Surveys

Brush Creek

Brush Creek continues to be sampled as part of a long term effectiveness monitoring project in conjunction with smolt trapping. In 1995 the smolt trap project began. Coho salmon mass spawning surveys were added in 1999 to monitor changes in the coho salmon population due to habitat enhancement work and an unfed fry experiment. Stream enhancement has been completed throughout much of the private timberland within the basin. Summer seeding densities in Brush Creek will be compared with out-migrant densities to estimate over-winter survival rates.

The reaches snorkeled in Brush Creek were established as 1000 meter reaches during the 2004 sampling season. Two of these reaches (mainstem Brush and Thistleburn) were electrofished in 2005. Thirty-two pools through three reaches in main stem Brush and nine pools in Thistleburn were sampled for 2006. In 2007, 52 pools in main stem Brush were sampled, and 15 pools were sampled in Thistleburn. The average seeding level in main stem Brush was 0.07 and in Thistleburn 0.561 coho per m^2 in 2005. In 2007 the average seeding levels for the main stem of Brush Creek were 0.442. For Thistleburn the average seeding levels were 0.807.

Mainstem Brush Creek numbers show fluctuations in densities, while Thistleburn densities have continued to increase from 2004 to 2007 (Table 16).

Table 16. Coho Salmon Densities (coho per m^2) by year in Brush Creek

Reach	2004	2005*	2006	2007
Mainstem	0.386	0.876	0.166	0.442
Thistleburn	N/A	0.561	0.676	0.807

***** Estimated using two-pass method electrofishing.

Big Tom Folley Creek

Big Tom Folley Creek was used as a control stream for comparison to Brush Creek until 2001. Beginning in 1997, monitoring of Big Tom Folley Creek included a spring smolt trap project and adult Coho mass surveys. In 2001, stream habitat enhancement projects and fish passage projects began within the basin. During 2005 the last of the private timberlands were treated and 1 mile of BLM property was treated. Here, as in Brush Creek, summer juvenile densities will be compared to out-migrant densities to estimate the over-winter survival rate.

In 2004, four reaches (two control and two treatment) were selected in the Big Tom Folley basin to be surveyed. The control and treatment reaches were paired up in main stem Tom Folley and North Fork Tom Folley Creeks. The 2007 sampling was completed through these same reaches to continue the comparison between the control and treatment reaches. Six pools in Big Tom Folley Creek and four pools in North Fork Tom Folley Creek were sampled in 2007. The average seeding level for the basin was 0.435 coho/m^2. The comparison between control and treatment reaches can be seen in Table 17.

At this time, no real trend has been detected, although the treatment reaches have shown less fluctuation in densities than the control reaches. Coho salmon densities within the treatment reaches seem to have an increasing trend but it is to soon to tell.

Table 17. Coho densities in control versus treatment reaches by year in Big Tom Folley.

Reach	2004(coho/ m^2)	2005(coho/m^2)	2006(coho/ m^2)	2007(coho/ m^2)
Big Tom Folley control	0.342	0.644	0.419	0.310
Big Tom Folley treatment	0.391	0.501	0.384	0.483
N. Fork Tom Folley control	1.109	0.404	0.722	0.269
N. Fork Tom Folley treatment	0.413	0.609	0.225	0.684

***** Electrofished, densities calculated using two-pass method.

Wolf Creek

Beginning in 1997, monitoring of Wolf Creek included a spring smolt trap project and adult coho mass surveys. In 2001, stream habitat enhancement projects and fish passage projects began within the basin. Here summer juvenile densities will be compared to out-migrant densities to estimate the over-winter survival rate.

Wolf Creek was sampled in 2007 using 1 control reach, 1 reference reach, and 4 treatment reaches.

The average seeding level for the Wolf Creek reaches were 0.663, and a total of 72 pools were snorkeled. For Rader Creek, the average seeding level was 0.682 and a total of 44 pools were snorkeled. For Miner Creek the average seeding level was 0.462 and a total of 21 pools were sampled. In 2007, the average seeding level for the basin was 0.640 coho/m^2 with a total of 137 pools sampled. The comparison between control, reference and treatment reaches can be seen in Table 18.

Table 18. Comparison of treatment, control, and reference reaches by number of pools sampled and average coho densities.

Reach	Treatment/Control /Reference	UTM	Pools Sampled	Average Coho Salmon Densities (coho/m^2)
Wolf 1	Treatment	Start- 452650E 4809145N End- 451569E 4809411N	11	0.132
Wolf 2	Reference	Start- 450906E 4810332N End- 450714E 4811126N	21	0.458
Wolf 3	Treatment		16	0.812
Wolf 4	Control	Start- 449898E 4812863N End- 449994E 4812853N	24	1.253
Rader	Control	Start- 450482E 4813521N End- 450164E 4814187N	28	0.557
Rader, Trib A	Treatment	Start- 450963E 4813078N End- 451536E 4813652N	16	0.807
Miner	Reference	Start- 450732E 4810274N End- 450152E 4810457N	21	0.462
Entire Basin			137	0.640

The majority of the coho juvenile seeding level surveys conducted in 2007 were performed as part of habitat enhancement monitoring and to provide for a comparison with out-migrant densities. For the 2007 surveying season, seeding level surveys were repeated in Brush and Big Tom Folley to provide trend data and to continue to examine the effects of basin wide stream habitat enhancement. In 2008 Brush, Big Tom Folley, and Wolf Creek will once again be snorkeled to provide comparison data to the previous years.

Future of Project

Due to staff turnover, portions of the data collected for this project have not been analyzed. Therefore, results presented in this report are preliminary and have not been error checked or through formal agency review. The final project report will be finished by January 2009. Currently, a new OWEB grant will continue to fund portions of this long term dataset. Ideally the future of the project will be to attempt to continue effectiveness monitoring and delve further into the issue of fish productivity resulting from restoration projects.

Acknowledgements

Additional funding for this project was supplied by Seneca Jones Timber Company and Lone Rock Timber Company. Oregon Department of Fish and Wildlife donated in-kind work as staff labor, equipment, and data analysis. Other portions of this grant were funded in part by Roseburg District Bureau of Land Management, Roseburg District BLM RAC, Roseburg District BLM CCI, and Roseburg Resources Company.

References

Aquatic Inventories Project: Methods for Stream Habitat Surveys. 2007. Conservation and Recovery Program, Oregon Department of Fish and Wildlife, Corvallis, OR.

Brick, J. and G.F. Huchko. 2006. Summary of habitat and fish monitoring data from Hinkle Creek: 2001-2006. Oregon Department of Fish and Wildlife, Roseburg, OR.

Jepsen, D.B. and J.D. Rodgers. 2004. Abundance monitoring of juvenile salmonids in Oregon coastal streams, 2002-2003. Monitoring Program Report Number OPSW-ODFW-2003-1, Oregon Department of Fish and Wildlife. Portland, OR.

Jepsen, D.B., T. Dalton, S.L. Johnson, K.A. Leader, and B.A. Miller. 2006. Salmonid Life Cycle Monitoring in Western Oregon streams, 2003-2005. Monitoring Program Report Number OPSW-ODFW-2006-2, Oregon Department of Fish and Wildlife, Salem, OR.

Oregon Adult Salmonid Inventory and Sampling Project (OASIS). 2007a. Coastal Salmon Spawning Survey Procedures Manual. Oregon Department of Fish and Wildlife. Corvallis, OR.

Oregon Adult Salmonid Inventory and Sampling Project (OASIS). 2007b. Coastal Steelhead Spawning Survey Procedures Manual. Oregon Department of Fish and Wildlife. Corvallis, OR.