Hatchery and Supplementation Program

FINAL
2015 Report

Lewis River Hydroelectric Projects

FERC Project Nos. 935, 2071, 2111, 2213

PACIFICORP

A BERKSHIRE HATHAWAY ENERGY COMPANY

Erik Lesko

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1.0 INTRODUCTION

The purpose of this report is to document results from field studies associated with implementation of the Hatchery and Supplementation (H&S) Program during 2015. Monitoring and evaluation (M&E) activities of the H&S program are planned in consultation with the H&S subgroup and incorporated into the Annual Operating Plan (AOP) each year. The following key activities were completed as part of the 2015 AOP:

- Transport of winter steelhead and early and late coho salmon upstream of Swift Dam
- Screw trapping of emigrating juveniles downstream of Merwin Dam
- Carcass and redd surveys downstream of Merwin Dam
- Broodstock collection and production for wild winter steelhead supplementation
- Hatchery production of trout and salmon as stipulated in Section 8 of the Lewis River Settlement Agreement.
- Fall Chinook carcass surveys downstream of Merwin Dam

This report is required by Section 8.2.4 of the Lewis River Settlement Agreement that states:

"On an annual basis, the Licensees shall provide to the ACC for review and comment a report compiling all information gathered pursuant to implementation of the Hatchery and Supplementation Plan. The report also will include recommendations for ongoing management of the Hatchery and Supplementation Program. The ACC shall have 60 days to comment on the annual report. Within 60 days of the close of the comment period, the Licensees shall finalize the report after consideration of all comments. The Licensees shall also provide the comprehensive periodic review undertaken pursuant to Section 8.2.6 below to the ACC. The Licensees shall provide final annual reports and the comprehensive periodic review to the Services during the development of any required ESA permit or authorization for hatchery operations, including NOAA Fisheries' HGMP process. The report may be included as part of the detailed annual reports of the ACC activities required by Section 14.2.6."

2.0 LATE WINTER STEELHEAD

Late winter steelhead in the Lewis River are composed primarily of native stock. This stock is preferred in reestablishing a population upstream of Swift Dam. The program is composed of three main elements:

- Broodstock collection at traps and through in river netting.
- Spawning and rearing at Merwin Hatchery.
- Transport of returning adults upstream of Swift Dam.

The primary goal of this program is to support a self-sustaining population upstream of Swift Dam that in time requires no hatchery support. Table 1 provides a summary of steelhead collected for the years 2009 through 2015.

Table 1. Summary of total captures of winter steelhead by method between 2009 and 2015 (excludes recaptures).

	YEAR						
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Merwin Trap	27	48	25	193	752	1,075	1,323
Lewis River Trap	0	0	0	7	5	1	0
Tangle Netting	39	42	65	166	103	162	114
Angling	8	2	Discontinued in 2011				
TOTAL	**74**	**92**	**90**	**366**	**860**	**1,238**	**1,437**

* Note: Two steelhead in the Merwin Trap were repeat spawners from 2014. One of which (Male) had been spawned at Merwin Hatchery and released

2.1 Broodstock Collection

Broodstock collection relied principally on two methods: (1) trapping at Merwin Dam and (2) tangle netting. All captured NOR winter steelhead from the Merwin Trap an in-river netting were transported to Merwin Hatchery for genetic assignment analysis. Once results were known, these fish were either held for broodstock or released back to river depending on predetermined collection curves. All program fish (BWT) captured in the Merwin Trap were immediately transported upstream of Swift Dam as part of the supplementation program. Data for all steelhead transported to the Merwin hatchery are provided in Appendix A.

2.1.1 Merwin Trap

The first NOR steelhead arrived at the Merwin trap on January 6, 2015; the first BWT steelhead was captured on January 1, 2016. During the period January 1 – July 4, sixty-eight (5%) NOR steelhead and 1,255 (95%) BWT winter steelhead were captured at the Merwin trap (Table 2). In addition, to the typical BWT and NOR steelhead, the trap also trapped eight BWT steelhead with a clipped adipose fin. Genetic analyses of these fish indicated origin to Lewis River and likely represent supplementation program fish that were inadvertently clipped.

Figure 1 illustrates the sex ratio of all steelhead returning to the Merwin trap by month. For every month males outnumbered females. Ratio of males to females was 1.46 to 1.

Table 2. Disposition of Winter Steelhead Captured at the Merwin Trap between January 1 and July 4, 2015.

	Males	Females
NOR		
Transferred to Merwin (NOR)	40	28
BWT		
Upriver Transport (BWT)	735	503
Kelts (to river)	3	0
Mortalities	5	1
BWT + AD Clip*		
Returned to River	2	6
TOTAL	**785**	**538**

BWT returns that were inadvertently AD clipped prior to release.

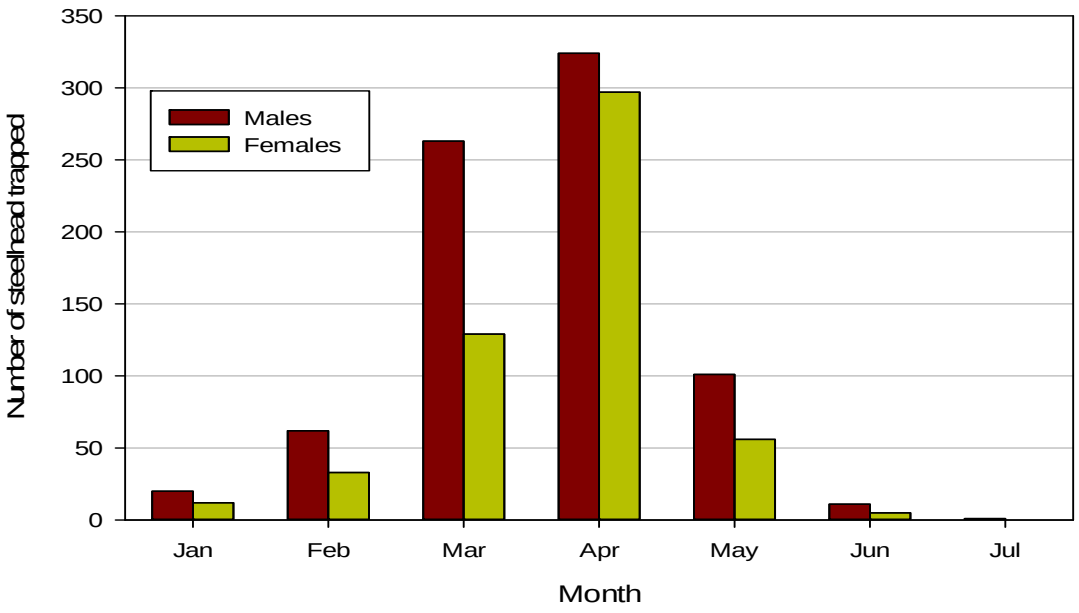

Figure 1. Total number of male and female steelhead trapped at the Merwin Collection Facility by month between January 1, 2015 and July 4, 2015.

Figure 2 illustrates the proportion of both NOR and BWT steelhead captured by month. BWT steelhead captures peaked in April while NOR steelhead peak captures were in May. More specifically, 88% of the BWT steelhead were captured by May 1 whereas only 55% of the total NOR's had been captured. The ratio of BWT to NOR steelhead was 18.3 to 1.

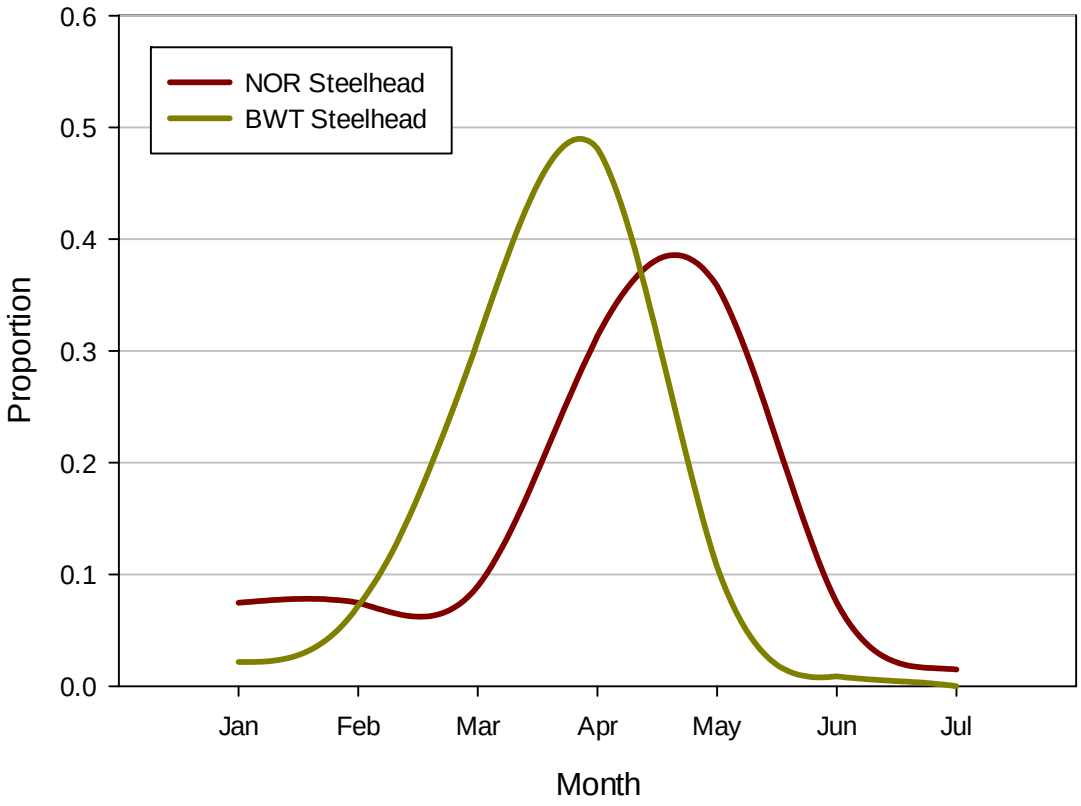

Figure 2. Monthly proportion of NOR and BWT steelhead trapped at the Merwin Collection Facility between January 1, 2015 and July 4, 2015.

2.1.2 Tangle Netting

Tangle netting efforts began on February 10, 2015 and continued through April 28, 2015. A PacifiCorp crew of two biologists netted at least once per week depending on river conditions. Six to eight pound test monofilament, 4-inch (stretch) mesh tangle nets are drifted in known and established steelhead holding areas. Once steelhead become entangled in the drifting net it is pulled into the boat, freed and then placed in an insulated cooler with fresh river water. All steelhead are processed on the boat and either released or transported to an oxygenated holding tank at the Lewis River hatchery access area. Table 3 summarizes the disposition of steelhead captured during tangle netting efforts.

Table 3. Disposition of steelhead captured through tangle netting in 2015.

	Males	Females
RETAINED		
NOR shipped to Merwin	10	6
BWT transported upstream	23	4
AD Clipped (Euthanized)	0	4
RELEASED (*On-Site*)		
NOR	28	5
BWT	12	6
AD Clipped Kelts	1	3
BWT (radio tagged)	11	1
Mortalities	0	0
TOTAL	**85**	**29**

In total, 114 steelhead were captured through the tangle netting program. Of these, 49 (43%) were of natural origin (Figure 3). Remaining steelhead 65 (57%) were either program returns (BWT) or from traditional hatchery programs. Sex ratio of males to females was 2.9 to 1.

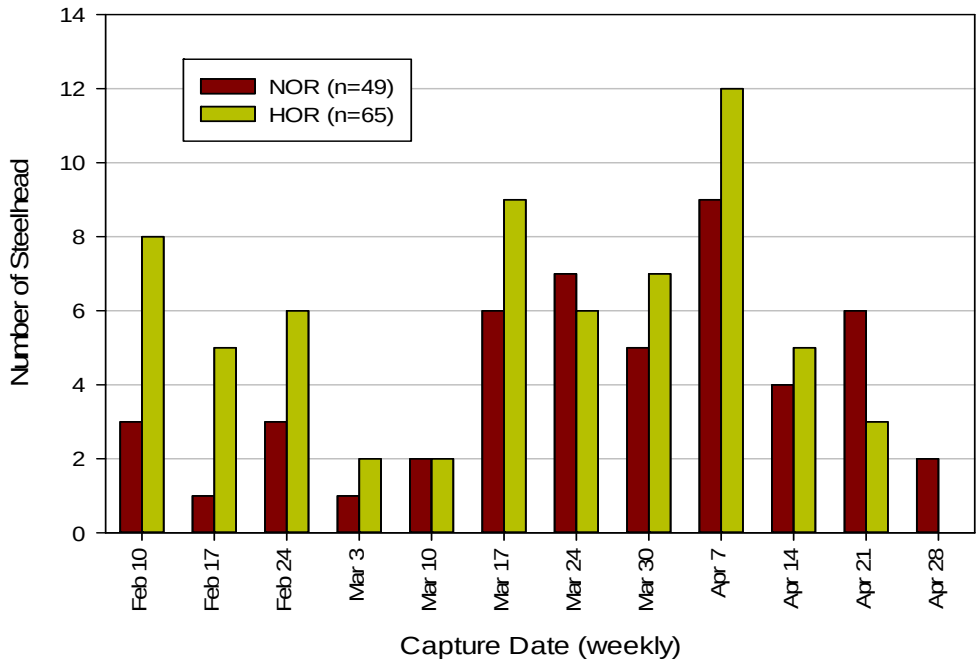

Figure 3. Composition of winter steelhead captured through tangle netting between February 10, 2015 and April 28, 2015 (n= 114).

2.2 Winter Steelhead Broodstock Collection Timing

The ability to conform to predetermined collection curves presents several difficulties in the field. Several variables continue to make broodstock collection challenging. Specific variables include the following:

- Additional fish (than stipulated in the collection curve) need to be captured each period to compensate for steelhead that do not assign as acceptable broodstock.
- Spawning maturity varies substantially in females, which adds uncertainty when deciding to retain or release male broodstock.
- Capture efficiency is affected by river flow and turbidity which may change daily.
- Sex ratios are variable and having adequate numbers of females is often challenging.
- Steelhead condition varies throughout the collection period with a larger percentage of fish being returned to river later in the collection window due to ripeness, and,
- Fecundity varies substantially from fish to fish and from year to year.

Because of these variables, the collection curve is meant to be a guide for collection crews to help plan fish collection activities on a weekly basis. This planning helps to ensure that fish are collected across their spawning period to preserve genetic diversity among the available broodstock.

According to the collection curve proposed in the annual plan for 2015, up to 50 steelhead are held for broodstock and spawned over the course of the run. Between February 9 and May 18, 2015, 62 steelhead were transferred to Merwin Hatchery as potential broodstock. Of these, 50 were spawned (25 pair) and 12 were released back to river due to unacceptable genetic assignment, poor condition or because egg take goals had already been met. Figure 4 provides the capture timing of broodstock that were used for spawning relative to the proposed collection curve.

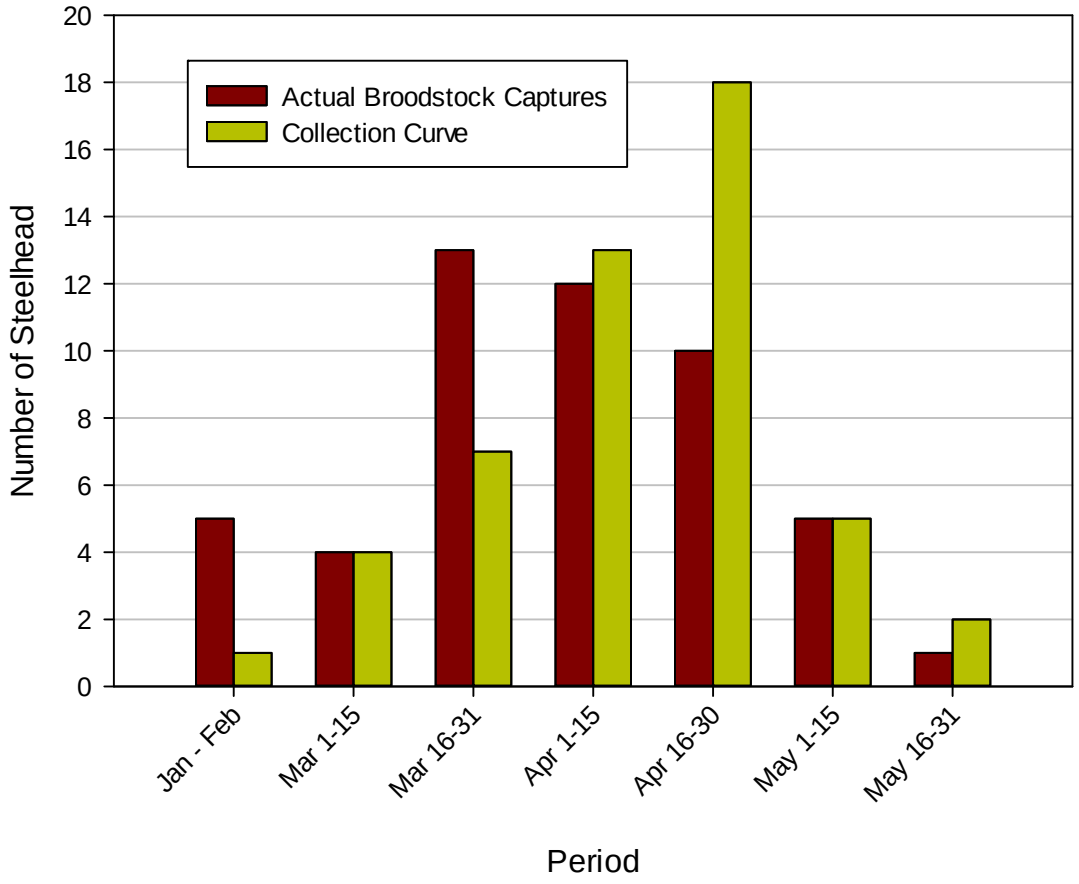

Figure 4. Actual collection timing of steelhead used as broodstock compared to predetermined collection curve during the 2015 season.

2.3 Genetic Analysis of Potential Broodstock

The H&S Subgroup agreed to use a genetic assignment target level of 50 percent or greater to the NF Lewis River or Cedar Creek stock(s) to be considered acceptable broodstock. Additionally, steelhead captured after April 1 with 50 percent or greater assignment to the Cascade Strata are also considered acceptable broodstock. The only exception to this rule is for fish showing hatchery assignment at levels greater than 5 percent. These fish would not be incorporated into the broodstock despite any assignment of 50 percent or greater to the NF Lewis River wild winter steelhead stock or Cascade Strata.

A total of 174 samples were taken from steelhead captured in the Merwin Trap, through tangle netting and the Cedar Creek Weir. All sampled steelhead were assigned a probability percentage as to likelihood of assignment to known baselines established for Lower Columbia River tributaries. Probabilities are classified as primary, secondary and tertiary to account for

introgression from other basins and provide a more complete picture of diversity present within the samples. Figure 5 provides an illustration of results of sampled (n=174) non-BWT steelhead. Appendix B provides the tabular genetic assignments results for each individual unclipped steelhead captured at the Merwin trap, tangle netting and at the Cedar Creek weir.

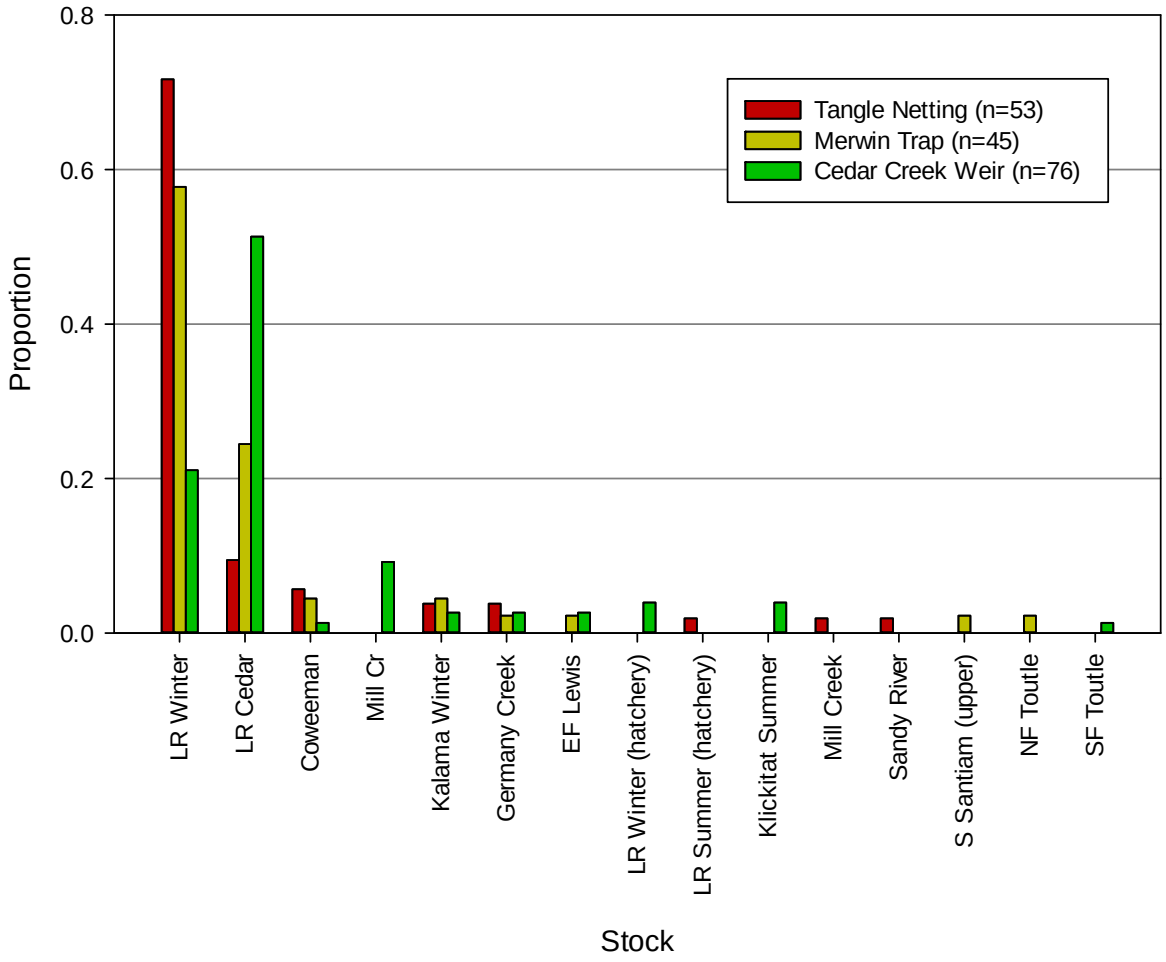

Figure 5. Proportion of primary genetic assignment for tangle netting, the Merwin Trap and Cedar Creek Weir (n=174).

2.4 Spawning and Egg Take

A total of 25 females and 25 males were spawned through 25 crosses between March 26 and May 22, 2015 (Appendix C). The target goal of 25 females and 25 males was achieved for the second consecutive year since 2009 (Table 4).

Fecundity averaged 3,891 eggs per female resulting in an estimated egg take of 107,775 (actual 97,265). However, one cross resulting in about 4400 eggs was separated after primary

assignment probabilities of the parents did not meet the genetic criteria established in the 2015 AOP. Eggs from this cross were hatched and released as unfed fry into the North Fork Lewis River. Appendix D provides the spawning log for 2015 indicating fecundity, eyed egg take and estimated egg loss.

Table 4. Number of spawning crosses and parents including the duration of each spawning periods for brood years between 2009 and 2015.

Brood Year	Crosses	Females	Males	Spawn Period	Days
2009	21	12	19	Mar 2 - May 21	81
2010	22	22	24	Mar 17 - May 14	56
2011	9	16	19	Mar 30 - May 18	49
2012	12	19	23	Apr 10 - May 29	49
2013	8	8	11	Apr 10 - May 6	26
2014	26	26	25	Apr 7 - May 16	39
2015	25	25	25	Mar 26 – May 22	58

2.5 Spawn Timing

Capture timing does not correlate well to spawn timing. One of the goals of this program is to spawn broodstock being held at Merwin Hatchery over the course of their natural spawn based on redd surveys in the lower river. Peak spawn timing for broodstock held at Merwin Hatchery occurred during the week of April 19 (Figure 6). No spawning occurred during the week of April 26 due to the lack of females.

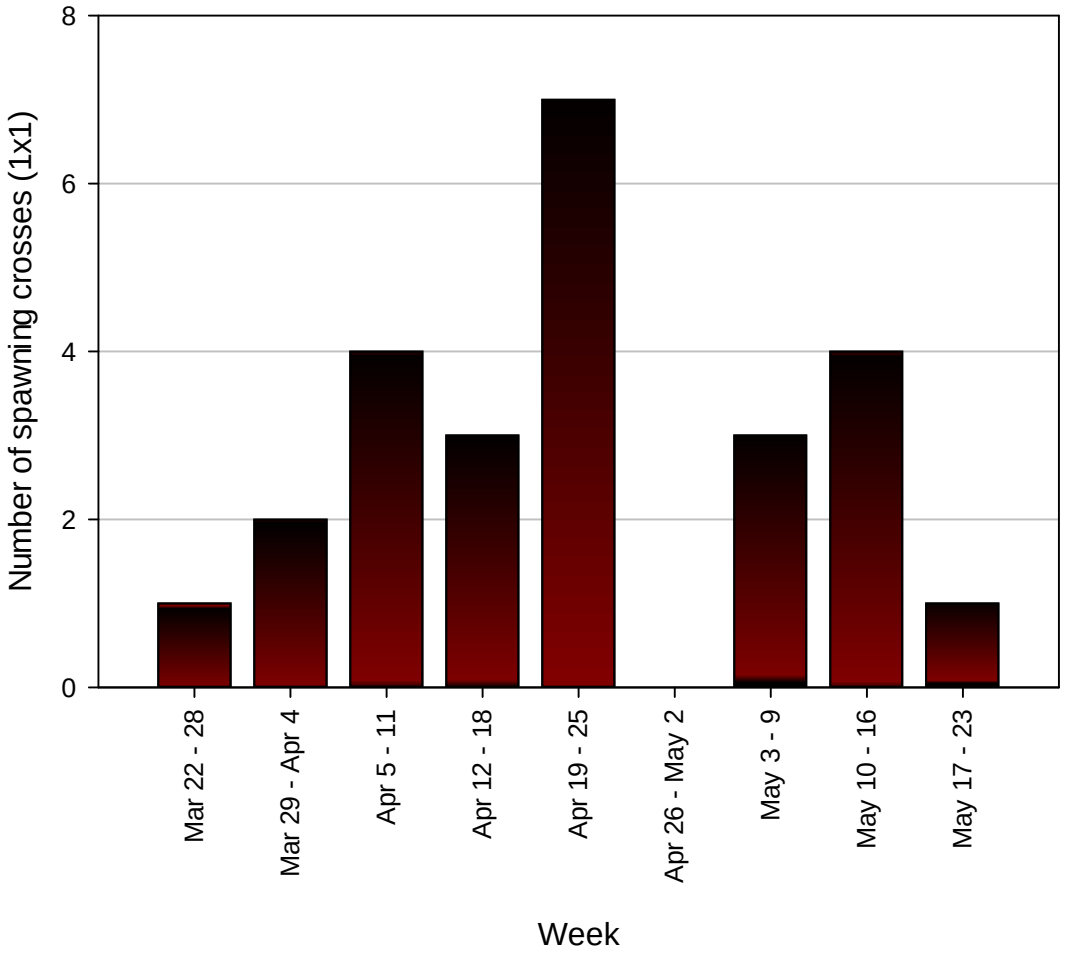

Figure 6. Spawn timing of broodstock held at the Merwin Hatchery. All crosses (n=25) are 1x1

2.6 Rearing, Tagging and Release

Of the 84,337 fry ponded, 29.3 percent (24,745) succumbed to natural mortality, bacterial coldwater disease (BCW), ichthyopthirius (Ich), and Furunculosis. Because the egg take goal was achieved, the 2016 release is expected to release 60,000.

2.6.1 Rearing

Table 5. Summary of rearing statistics for the 2015 brood year

GENERAL	STATISTIC
Actual Egg Take	97,265
Eyed Eggs	91,022
Total Fry Ponded	84,337
Total Fry out-planted (unfed)	4,400
MORTALITY	
Egg Loss %	6.42%
Total Rearing Loss	24,745
Due to natural causes	1,793
Due to disease (ich and Furunculosis)	2,475
Due to disease (BCW)	20,477
Shortage / Adjustment	-1,748
RELEASE	
Projected Smolt Release (survival)	60,000
Release Date (Start Volitional)	May 1, 2016
Release size	8 fpp

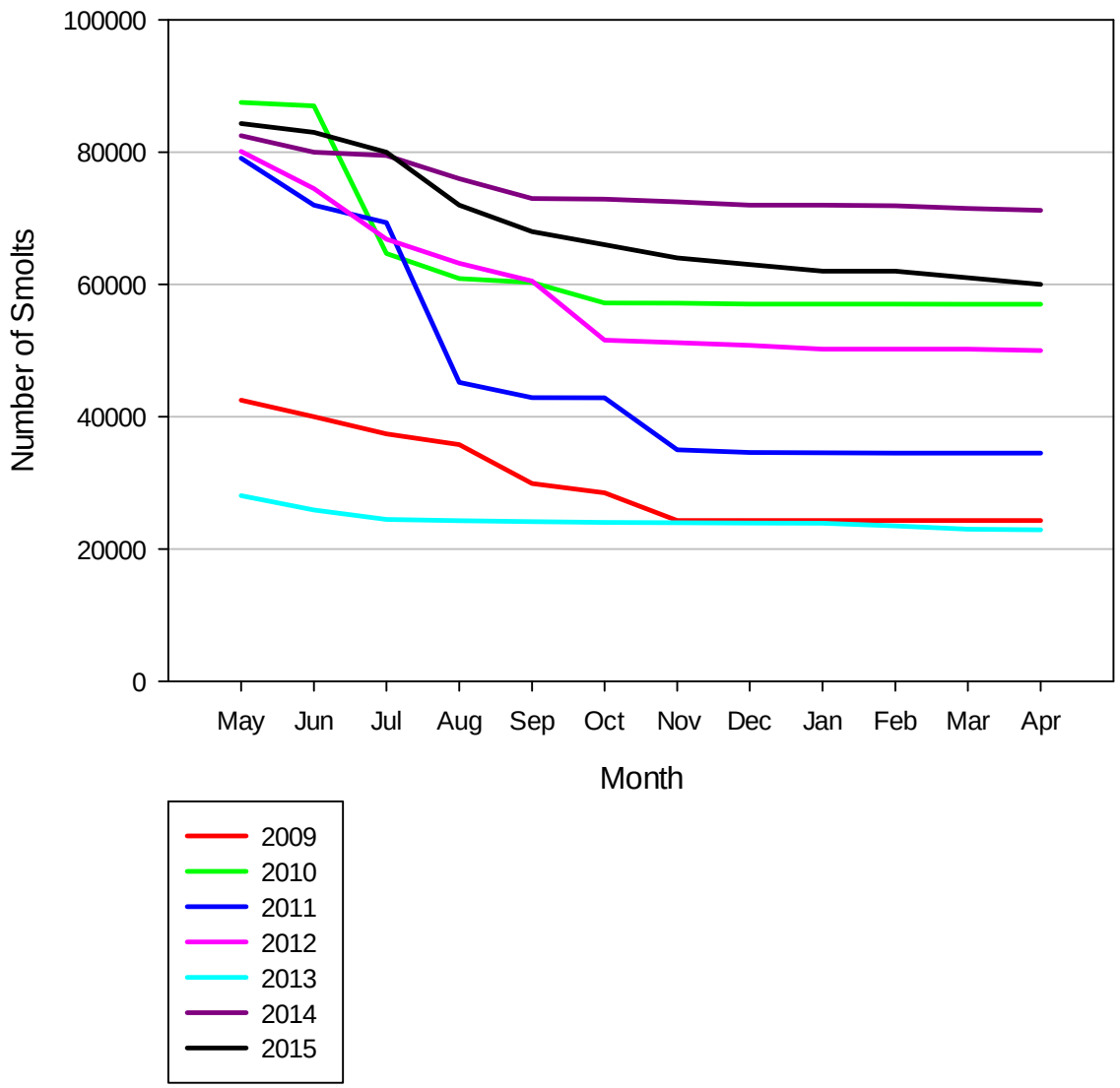

Figure 7. Observed mortality rate of fish ponded for brood years 2009 through 2015

2.6.2 Tagging

All subyearling steelhead were tagged with blank wire snout tag in December 2015.

2.6.3 Release

All fish will be volitionally released on May 1, 2016 at the Merwin boat launch. Volitional release will continue until June 1, 2016. Any fish remaining in the ponds on June 1, 2016 will be forced out and released downstream of the County Bridge in Woodland, WA. Projected average release size in 8 per pound. A total release number of 60,000 smolts is projected.

3.0 MONITORING AND EVALUATION

3.1 Winter Steelhead Redd Surveys (Lower River)

Redd surveys are used to estimate spawning abundance and distribution of winter steelhead in the mainstem North Fork Lewis River. Surveys are conducted weekly throughout the spawning period, which typically starts March 1 and extends into mid-June.

3.1.1 Spawning Abundance

Spawning abundance estimates rely on new redd census data, assumed sex ratio and females per redd to calculate total spawner abundance (Freymond and Foley 1986). Females per redd follow WDFW generalized guidelines of 0.81 females per redd and sex ratio is assumed equal (Table 6). Beginning in 2013, we also calculate the spawner abundance using the observed sex ratio of late winter steelhead entering the Merwin Trap. This may be a more accurate estimate of female to male ratio in the river because of the large numbers captured in the trap and is unbiased in terms of capture efficiency for males or females.

Using trap data collected for 2015, a total of 1,323 steelhead were trapped. These include mainly BWT steelhead, but also include steelhead held for broodstock and steelhead released because of stubby dorsal fins and no wire tag in their snout. Of this total, 785 were male and 538 were female. Therefore, for every female we assume that there are 1.46 males (instead of 1) that make up the population. As a result, the corrected population estimate is higher than assuming the 1:1 ratio (Table 6). The number of redds per female should also be verified at some point to improve the accuracy of this estimate.

By combining trap counts and in-river abundance estimates through redd surveys a total estimate of escapement can be calculated. Total escapement of late winter steelhead (to include both NOR and BWT) to the North Fork Lewis River is 2,088 (Table 8).

Table 6. Late Winter Steelhead Abundance Downstream of Merwin Dam 2008 through 2015 based on redd counts.

Year	Number of Redds observed	Spawner Estimate	Observed sex ratio (females : males)	Spawner Estimate (Corrected)
2008	131	212		
2009	176	286		
2010	248	402		
2011	108	174		
2012	343	556		
2013	456	739	1 : 1.43	898
2014	364	590	1 : 0.80	531
2015	384	622	1 : 1.46	765

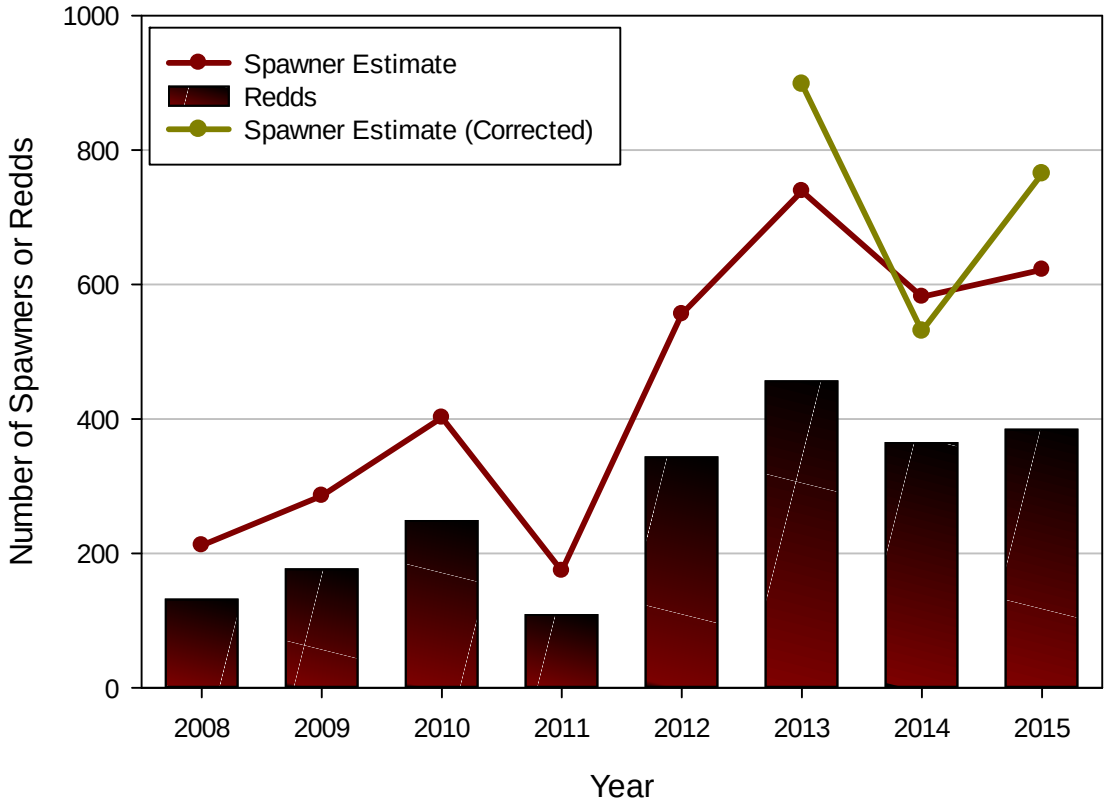

Figure 8. Wild winter steelhead spawner abundance downstream of Merwin Dam 2008 through 2015 based on redd counts.

3.1.2 Distribution

A summary of redd distribution is provided in Table 7. Reach number 2 had the most redds and the highest density given the amount of available habitat. Most of this density is concentrated just upstream of a small riffle about ¾ of mile downstream of Merwin Dam nicknamed Haggedorn's. It is not fully understood why this area is used so extensively used by steelhead for spawning but it remains consistent from year to year. One key difference in this area is the gravel size (relatively small) and consistent flow rates along the tailout of the main pool.

Redd locations are illustrated in Appendix E. Reach breaks coincide with WDFW reach breaks used for fall Chinook surveys.

Table 7. Redd distribution summary for reaches 1 through 5 including redds per mile

Reach	Reach Length (miles)	Redds	Redd per Mile
1	0.55	24	**44**
2	0.83	130	**157**
3	0.95	77	**81**
4	1.00	37	**37**
5	7.71	116	**15**
TOTAL	**11.04**	**384**	

Average redds per mile = 35

3.2 Proportion of hatchery origin spawners on the spawning grounds

Program returns are treated as hatchery origin (HOR) steelhead despite their genotype assignment to NOR stocks. This is due to the hatchery influence during mating and captive rearing conditions during their first year of life. As these program fish return as adults, there is opportunity for these (HOR) fish to spawn with NOR stocks. It has been shown that reproductive success (fitness) declines rapidly (up to 37 percent per captive reared generation) within a natural population (Araki et. al. 2007). The evolutionary mechanisms for declines in fitness are not fully understood, but hatchery protected rearing environments and controlled mating selection are suspected contributors to this decline (Araki et. al 2007). Inbreeding between program fish is also a concern because of loss in genetic diversity or effective population size further limits fitness and adaptability of the natural spawning population.

In 2015, the ratio of HOR to NOR captured through tangle netting is used to estimate pHOS and related PNI. Tangle netting provides a direct measure of the proportion of hatchery to natural origin fish on the spawning grounds when done during spawning and in areas where spawning is occurring. However, there is a portion of HOR steelhead caught in the tangle nets that are destined for the Merwin Trap based on trap returns in 2014 and 2015. Figure 9 provides the proportion of fish collected through the run time of late winter steelhead. April 8 represents the day in which half of the available steelhead are trapped suggesting that a portion of the BWT steelhead captured in the tangle nets are ultimately destined for the Merwin Trap and do not spawn in the lower river (i.e., they are not kelts upon entry into the trap).

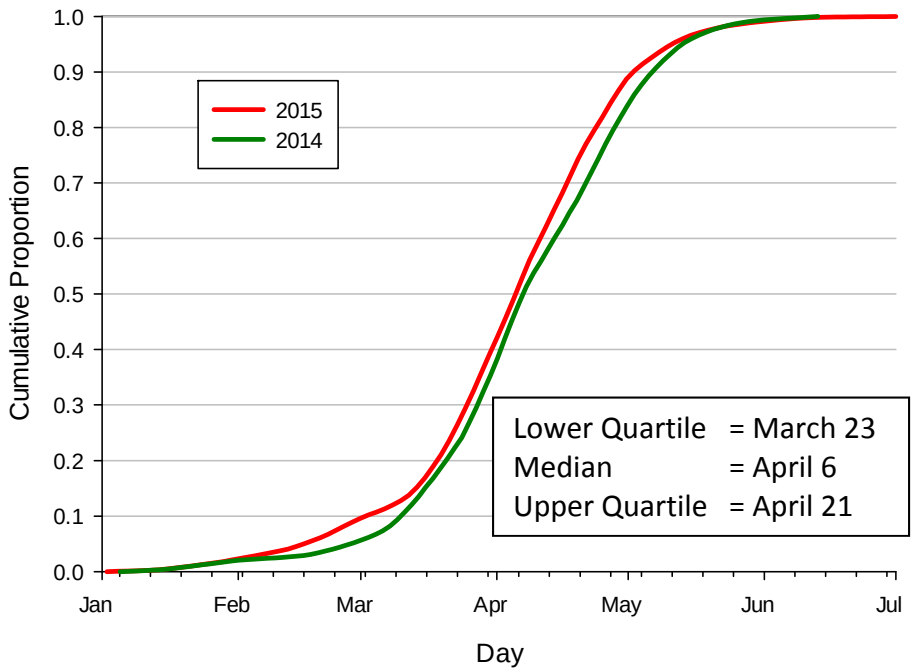

Figure 9. Cumulative proportion of steelhead captured at the Merwin Trap for years 2014 and 2015.

To estimate pHOS through tangle netting, the number of HOR (primarily BWT) and NOR are recorded during the peak spawn time of NOR winter steelhead in the Lewis River (Figure 3). The total HOR and NOR captures during the peak spawn time (March through the end of netting) provides an estimate of the ratio 'present' on the spawning grounds (Table 8). To account for HOR steelhead that have not yet entered the Merwin Trap, the number of HOR steelhead netted is adjusted based on the proportion of marked and released HOR steelhead that ultimately entered the Merwin Trap (Table 8).

The use of tangle netting is limited by its duration in that netting normally does not extend past the first or second week of May. Netting past this date raises the potential for disrupting and perhaps reducing natural spawning success, because nearly all steelhead captured past this date are either kelts or active spawners. Despite this limitation, tangle netting remains a means to directly sample and determine origin of steelhead while on the spawning grounds.

Table 8. Ratio of marked steelhead recaptured at the Merwin Trap including estimates of escapement, pHOS and PNI

Abundance	BWT	NOR	Total
Merwin Trap	1,255	68	1,323
Redd Survey			765
Total Escapement			2,088
Marks			
Tangle Netting	23		
Recaptured at Trap	7		
Recruitment to trap (avg)	0.30		
pHOS			
Peak Spawn time Average			45%
Season Average			51%
PNI			
Season Average			67%

Table 9. Weekly ratio of HOR and NOR steelhead captured in the tangle net for year 2015

Week	NOR	HOR (observed)	HOR (corrected*)	pHOS	PNI**
Feb-10	3	8	5.6	65%	61%
Feb-17	1	5	3.5	78%	56%
Feb-24	3	6	4.2	58%	63%
Mar-03	1	2	1.4	58%	63%
Mar-10	2	2	1.4	41%	71%
Mar-17	6	9	6.3	51%	66%
Mar-24	7	6	4.2	38%	73%
Mar-30	5	7	4.9	49%	67%
Apr-07	9	12	8.4	48%	67%
Apr-14	4	5	3.5	47%	68%
Apr-21	6	3	2.1	26%	79%

*** Corrected values reflect a reduction of 0.30% based on Merwin Trap recaptures**

****pNOB = 1 because all broodstock are tested for assignment to natural origin stocks**

Based on tangle net captures during the spawning period, we estimate the proportion of hatchery origin spawners is 45 percent (51 percent for the season). The main contributor to this estimate is the number of BWT steelhead on the spawning grounds during the natural spawning period. Based on our estimate, over half of the late winter steelhead spawning in the

North Fork Lewis River mainstem are of hatchery origin. The ability to remove a meaningful number of BWT and AD clipped winter steelhead spawning in the lower river would be challenging without directly and irreversibly reducing NOR spawning success.

Estimates of PNI are always going to exceed HSRG standards as long as the program continues to use only verified NOR broodstock. Estimates of PNI are provided in Table 9. HSRG recommendations for pHOS and PNI for late winter steelhead on the Lewis River are as follows:

- pHOS: < 30 percent
- PNI: > 50 percent

3.3 Recaptures of circular pond reared late winter steelhead

In 2013, a total of 1,205 late winter steelhead smolts were PIT tagged from circular rearing vessels. The purpose of this marking is to evaluate (1) return rates of circular reared smolts relative to rearing pond releases and (2) compare residualism rates of through tangle netting and screw trapping between circular reared and traditional pond rearing smolts.

In 2015, thirteen adults (1.1 %) were recaptured that had codes from the 2013 brood year (one from 2014 brood year). The ability to detect PIT tagged fish at the Merwin Trap was limited in 2015 because the automated detector was not installed until May. This likely resulted in positive PIT tagged steelhead being transported upstream as regular BWT steelhead (all circular tank fish were also tagged with blank wire tags). In 2016, the Merwin Trap will be fully functional with an automated PIT tag reader and an accurate count of circular tank returns will be possible. All fish caught during tangle netting are also wanded for PIT tags upon capture.

3.4 Upstream Transport of Steelhead, Coho and Spring Chinook

In 2015, a total of 1,265 blank wire tagged steelhead (758 males, 507 females) were transported upstream of Swift Dam (Table 9). Steelhead were transported from both the Merwin Trap and through tangle netting. Eighty-three (83) transported steelhead also received a gastric radio tag for distribution studies in the upper basin as part of the Aquatic Monitoring and Evaluation Plan.

This year represents the fourth year of steelhead transportation activities and numbers continue to increase each year. The goal of the H&S program is 500 winter steelhead transported each year. We have exceeded this target the last three years (Table 10).

In 2015, late coho were used for the first time for adult supplementation upstream of Swift Dam. This decision was made by the H&S subgroup and approved by the ACC. The main reason for this change was that both early and late coho are treated as the same population for recovery planning purposes. Also, by using late coho there is more flexibility in the transportation schedule to spread the transportation over a longer period of time. It is anticipated that over the years, survival between early and late coho will differ based on

natural processes (e.g., river flow, temperature, turbidity, etc) at the time each group spawns. This difference is considered beneficial as the natural environment will have a larger influence on survival.

Adult spring Chinook supplementation has not been possible for several years due to poor hatchery returns to the Lewis River hatchery. The WDFW is modifying the release timing of spring Chinook from the hatchery in hopes of improving survival of spring Chinook smolts and returns back to the Lewis in coming years.

Table 10. Summary of Winter Steelhead transported and released upstream of Swift Dam.

YEAR	Late Winter Steelhead		Coho (early and late)		Spring Chinook
	TOTAL	Radio Tagged (of total)	TOTAL	Radio Tagged (of total)	
2005			2,006		0
2006			1,848		155
2007			2,000		0
2008			2,000		0
2009			2,058		0
2010			1,822		188
2011			2,000		0
2012	189	39	206		0
2013	741	100	6,962		513
2014	1,033	82	9,179		0
2015*	1,265	83	3,754	99	0

***starting in 2015, late coho (type n) were also transported**

3.5 2015 Screw trap Operations

In 2015, the screw trapping effort was conducted near the golf course using two 8 foot diameter screwtraps from April 1 through June 12, 2015. Both traps were fastened together and fished in tandem for the duration of the sampling season. In total, 44,132 salmonids (15,223 smolts) were captured (Table 11). This is a significantly higher capture rate than the 3,013 smolts collected in 2014 despite significantly lower than normal river flow throughout the sampling period (Figure 10). In 2014, only a single 8-foot screwtrap was used.

The use of a tandem trap appears to improve trapping efficiency. In 2014, only coho were used to estimate trapping efficiency due to low capture rates of other species. The calculated trap efficiency in 2014 for coho was 0.98 percent compared to 1.5 percent in 2015 (Table 12). Steelhead and NOR coho had much higher efficiencies at 2.1 and 10.5 percent, respectively (Tables 13 and 14).

The use of a tandem trap will again be used in 2016. If flow rates in 2016 are representative of the historical average, efficiencies should improve over those observed in 2015.

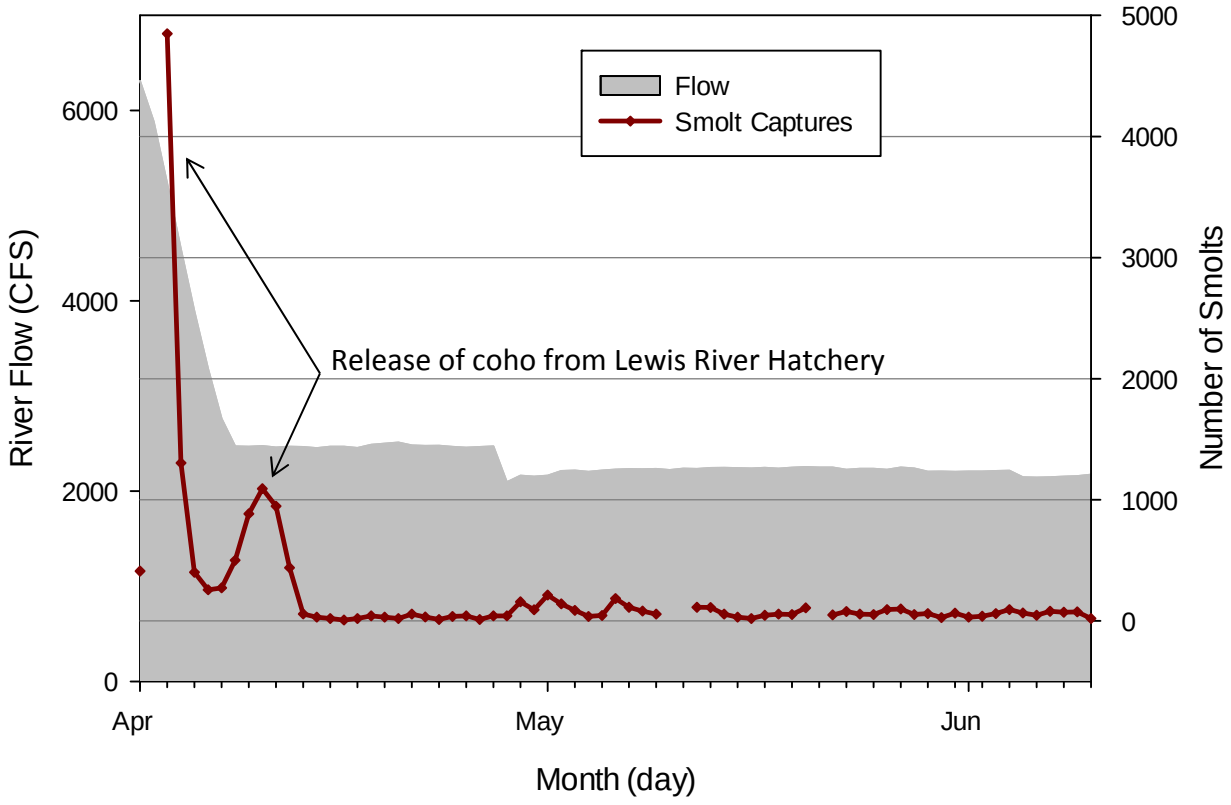

Figure 10. Total discharge from Merwin Dam between April 1 and June 10, 2015.

Table 11. Collection summary for the rotary screw trap deployed downstream of Merwin Dam April 1 - June 12, 2015.

Species	Smolt Type	Number Collected	Mean Length (FL, mm)	Marked and released upstream	Recaps	% Hatchery
Coho	NOR	1,168	124			91%
	AD	11,735	203			
	AD + CWT	180	138			
	CWT only	571	149			
TOTAL		13,654		2,822	43	
Steelhead	NOR	144	163			88%
	BWT	1,022	174			
	AD	30	183			
TOTAL		1,196		1,021	21	
Chinook	NOR (**fry**)	28,909	57			1%
	AD	321				
	AD + CWT	6				
TOTAL		29,236		1	0	
Cutthroat	NOR	46	188			0%

TOTAL SMOLTS = 15,223
TOTAL FRY (fall Chinook) = 28,909
TOTAL SALMONIDS = 44,132

Table 12. Weekly and total estimates of abundance for <u>all coho</u> smolts migrating past the lower Lewis River screwtraps April 1 – June 12, 2015.

Period		Total Smolts Captures (excluding recaptures)	Marked and Released Upstream	Recapture	Trap Efficiency*	Number of Migrants**
Week 1	April 1 - 7	7,492	376	3	0.008	938,997
Week 2	April 8 -14	3,953	266	0	0.015	263,533
Week 3	April 15 - 21	182	182	0	0.015	12,133
Week 4	April 22 - 28	182	181	0	0.015	12,133
Week 5	April 29 - May 5	196	183	5	0.027	7,174
Week 6	May 6 -12	227	225	7	0.031	7,296
Week 7	May 13- 19	241	241	8	0.033	7,260
Week 8	May 20 - 26	375	368	5	0.014	27,600
Week 9	May 27 - June 2	340	340	5	0.015	23,120
Week 10	June 3 - 12	466	460	10	0.022	21,436
TOTAL		**13,654**	**2,822**	**43**	**0.015**	**1,320,683**

*** for zero recaptures, seasonal efficiency (0.015) was used to calculate the number of weekly migrants.**

**** if using seasonal efficiency (rather than weekly) the estimate of migrants is 896,083**

Table 13. Weekly and total estimates of abundance for NOR coho smolts migrating past the lower Lewis River screwtraps April 1 – June 12, 2015.

Period		Total Smolts Captures (excluding recaptures)	Marked and Released Upstream	Recapture	Trap Efficiency*	Number of Migrants**
Week 1	April 1 - 7	346	35	2	0.057	6,055
Week 2	April 8 -14	501	7	0	0.102	4,912
Week 3	April 15 - 21	11	11	0	0.102	108
Week 4	April 22 - 28	17	17	0	0.102	167
Week 5	April 29 - May 5	25	25	4	0.160	156
Week 6	May 6 -12	42	42	7	0.167	252
Week 7	May 13- 19	53	53	7	0.132	401
Week 8	May 20 - 26	77	76	5	0.066	1,170
Week 9	May 27 - June 2	82	82	5	0.061	1,345
Week 10	June 3 - 12	14	13	8	0.615	23
TOTAL		1168	361	38	**0.105**	14,589

*** for zero recaptures, seasonal efficiency (0.102) was used to calculate the number of weekly migrants.**

**** if using seasonal efficiency (rather than weekly) the estimate of migrants is 11,396**

Table 14. Weekly and total estimates of abundance for all steelhead smolts migrating past the lower Lewis River screwtraps April 1 - June 9, 2015.

Period		Total Smolt Captures (excludes recaptures)	Marked and Released Upstream	Recapture	Trap Efficiency *	Number of Migrants**
Week 1	April 1 - 7	1	1	0	0.021	48
Week 2	April 8 -14	12	11	0	0.021	571
Week 3	April 15 - 21	11	10	0	0.021	524
Week 4	April 22 - 28	36	36	0	0.021	1,714
Week 5	April 29 - May 5	575	462	7	0.015	37,950
Week 6	May 6 -12	317	274	6	0.022	14,476
Week 7	May 13- 19	133	126	5	0.040	3,352
Week 8	May 20 - 26	61	51	2	0.039	1,556
Week 9	May 27 - June 2	31	31	1	0.032	961
Week 10	June 3 - 9	19	19	0	0.021	905
TOTAL		**1,196**	**1,021**	**21**	**0.021**	**62,056**

*** for zero recaptures, seasonal efficiency (0.021) was used to calculate the number of weekly migrants.**
**** if using seasonal efficiency (rather than weekly) the estimate of migrants is 59,169**

3.6 Mainstem Carcass and Redd Surveys

NOTE: Mainstem and tributary carcass survey data for spring Chinook and coho are surveyed beginning in the fall season of each year and extend until the end of January. This schedule does not typically provide adequate time to input, review and analyze collected data and present the results in formal reporting by April 1 of each year. Therefore, reporting for mainstem and tributary surveys of coho and spring Chinook may be delayed one year from the survey period. However, placeholder titles in each report iteration are never removed until the data are available, analyzed or deemed inadequate. This is especially true of tributary coho estimates whereby estimates of adult coho abundance are grouped into the larger lower Columbia River DPS. These results will be presented when WDFW completes their final analysis for years 2012 – 2014.

For lower Lewis River mainstem surveys of coho and spring Chinook results are presented in this report for survey year 2015. Field work was completed by Meridian Environmental and analysis of the data was performed by West, Inc. For 2013 and 2014 revised abundance estimates for coho are provided in Appendix F. These revised estimates account for loss on capture when carcasses are re-sighted then removed from the marked population. 2015 abundance estimates for both spring Chinook and coho salmon are provided in Appendix G of this report.

Fall Chinook abundance estimates are reported by WDFW and included as Appendix H.

3.5.1 Coho Salmon Tributary Surveys – 2012, 2013 and 2014: **WDFW to provide results**

3.5.2 2015 Spring Chinook and Coho Salmon Survey results summary

Table 15. Summary of spring Chinook and coho salmon spawning surveys downstream of Merwin Dam (September 2015 through January 2016)

Stream	Reach Length (miles)	Total Weeks	Weeks Surveyable	New Redds	Live Holders	Live Spawners	Hatchery Male Carcass	Hatchery Female Carcass	Unmarked Male Carcass	Unmarked Female Carcass	Total Carcass	Carcass Tagged	Carcass Tags Recovered	Pre-spawn Mortality (Females)	Carcass Wanded for CWT	CWT Positive Carcass
September 2015 through mid-October 2015 Spring Chinook Salmon Summary																
NF Lewis R. Reach 1	0.57	6	6	2	17	8	19	17	3	1	40	?[5]	0[a]	50%	31	0
NF Lewis R. Reach 2	0.68	6	6	409	5	1205	147	99	18	23	287	?[5]	5[a]	3%	197	1
NF Lewis R. Reach 3	0.97	6	6	503	5	1297	126	85	13	23	247	?[5]	2[a]	2%	179	0
NF Lewis R. Reach 4	1.32	6	6	443	232	982	68	51	12	10	141	?[5]	1[a]	0%	107	0
[1]NF Lewis R. Reach 5	2.91	6	6	128	38	198	22	27	12	16	77	?[5]	0[a]	20%	55	0
NF Lewis R. total	6.45	6	6	1485	297	3690	382	279	58	73	792	?[5]	8[a]	5%	569	1
mid-October 2015 through January 2016 Coho Salmon Summary																
NF Lewis R. Reach 1	0.57	15	12	NA[2]	NA[3]	NA[3]	0	0	0	0	0	0	0	NA	0	NA
NF Lewis R. Reach 2	0.68	15	12	NA[2]	NA[3]	NA[3]	0	0	0	0	0	0	0	NA	0	NA
NF Lewis R. Reach 3	0.97	15	12	NA[2]	NA[3]	NA[3]	0	0	0	0	0	0	0	NA	0	NA
NF Lewis R. Reach 4	1.32	15	12	NA[2]	NA[3]	NA[3]	1	0	0	1	2	2	1	0%	2	0
NF Lewis R. Reach 5	7.30	15	12	NA[2]	NA[3]	NA[3]	1	8	0	1	10	10	1	100%	10	2
NF Lewis R. total	10.84	15	12	NA[2]	NA[3]	NA[3]	2	8	0	2	12	12	2	90%	12	2
Bratton Creek	1.0	15	10	0	0	0	0	1	0	0	1	NA[6]	NA[6]	0%	1	0
Hayes Creek	1.0	15	11	0	0	0	0	0	1	0	1	NA[6]	NA[6]	NA	1	0
Houghton Creek	1.0	15	10	0	0	0	0	0	0	0	0	NA[6]	NA[6]	NA	0	NA
[4]Johnson Creek	1.00	15	10	0	0	2	0	0	0	0	0	NA[6]	NA[6]	NA	0	NA
Ross Creek	0.95	15	10	2	0	10	0	3	0	0	3	NA[6]	NA[6]	0%	3	0
Tributaries Total	4.95	15	10	2	0	12	0	4	1	0	5	NA[6]	NA[6]	0%	5	0

[1]All Reach 5 surveys ended at the Golf Course ramp due to low water conditions.
[2]Redd surveys in the mainstem NF Lewis R were ineffective at differentiating coho vs. fall Chinook redds due to the large number of fall Chinook spawning compared to coho.
[3]Peak counts of live spawners and holders were hindered by poor visibility due to high flows and associated turbidity, and the large number of fall Chinook present.
[4]Total Johnson Creek survey reach length is 1.0 miles, but about 0.15 miles within the 1.0 mile reach was not surveyed due to denial of access by the landowner.
[5]WDFW conducted carcass tagging and the total carcass tags deployed overlapping with this survey effort is unknown.
[6]Carcass tagging is not part of the tributary coho survey methodology.
[a]WDFW carcass tags recovered.

4.0 RECOMMENDATIONS FOR ONGOING MANAGEMENT

Improvements in the way we handle and rear steelhead from wild winter broodstock continues to improve. Observed mortality of adults, juveniles and eggs has declined from previous years. Also, rearing conditions have improved as recommendations from the H&S subgroup have been implemented. Returns of late winter steelhead reared in circular tanks will continue to return through 2018. If results suggest survival benefits (SAR), the use of circular tank rearing may be expanded to include a larger portion of the steelhead smolt releases and longer duration of rearing in circular tanks.

Developing estimates of abundance for juveniles that meet precision goals continues to be a challenge. Annual planning meetings need to focus on developing standardized sampling methods that strive to meet NOAA precision guidelines for monitoring fish populations. Our trapping efforts for estimating juvenile abundance currently does not achieve collection efficiencies needed to meet precision goals of abundance (migrants). In 2016, the tandem trap will again be deployed. More normal flows may improve trap efficiencies beyond those observed in 2015 due to historically low flows on the North Fork Lewis River.

In addition to monitoring methods, the H&S Subgroup should focus on the effects of the late winter broodstock program on NOR winter steelhead stocks in the lower river. The effects of mining and of program returns competing and spawning with NOR steelhead in the lower river needs more comprehensive evaluation. While the program is temporary, there may be long term genetic impacts to the locally adapted population that may not yet be realized. These potential impacts should be monitored with methods that are now available to quantify metrics such as effective population size and inbreeding coefficients. These metrics are consistent with regional best management practices and should be developed further for the North Fork Lewis River late winter steelhead program. Additionally, ongoing genetic testing of returning program fish should be used to determine whether spawning crosses and resulting families are well represented in the adult program returns. If family representation is not well represented, spawning protocols need to be modified based on recommendations from regional geneticist to ensure (as best we can) that each family is equally represented in the program returns.

As the program matures into its 8th year, the potential for non-marked steelhead captured in the Merwin Trap originating from natural spawning of BWT steelhead in the lower river or upstream of Swift Dam increases. These fish are indistinguishable from native stocks despite their ancestry to hatchery programs. The fact that there are no means to differentiate these fish may result in broodstock selection of F2 program fish. This risk has to be accepted for the program to continue. Microsattelite analysis will continue with all broodstock to ensure that Chambers Creek stock or other hatchery strays are not used in the program.

5.0 REFERENCES

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APPENDIX A - Wild Winter Steelhead Collection Log - 2015

Appendix A: Broodstock Transferred to Merwin Hatchery - 2015

Trap Date	Capture Method	Gender	Fork Length (cm)	Pit Tag #	DNA Sample #	DNA Results	Scale Card # - Position	Returned To River	Comments
2/9/2015	Merwin Trap	M	60	A203	MT15-1	LRMerwin .8011	4634-1	Y	Spawned 3/26 w/ Female MT15-8
2/16/2015	Merwin Trap	M	56	A1EF	MT15-2	LRMerwin .6766	4634-2	Y	Spawned 4/14 w/ Female MT 15-20
2/17/2015	Tangle Net	M	71	BC96066	TN15-6	LRMerwin .7286		Y	Spawned 4/22 w/ female MT15-27
2/19/2015	Merwin Trap	F	73	A238	MT15-3	Germany cr. .9922	4634-3	Y	
2/21/2015	Merwin Trap	M	69	A206	MT15-4	LRMerwin .9297	4634-4	N	Spawned 4/10 w/ Female MT 15-13
2/22/2015	Merwin Trap	M	89	A200	MT15-5	LRMerwin .8173	4634-5	N	Spawned 4/15 w/ female MT15-24
3/3/2015	Merwin Trap	F	63	A205	MT15-6	NFToutleR .8258	4634-6	N	Spawned 4/6 w/ Male TN 15-16
3/10/2015	Tangle Net	F	81	BC96066	TN15-14	LRMerwin .8736		Y	Spawned 4/1 w/ Male TN15-15
3/10/2015	Tangle Net	M	76	BC96054	TN15-15	LRMerwin .8352		Y	Spawned 4/1 w/ Female TN15-14
3/14/2015	Merwin Trap	M	75	A22F	MT15-7	LRMerwin .5374	4635-1	N	Spawned 4/6 w/ Female MT 15-14
3/17/2015	Tangle Net	M	91	BC96074	TN15-16	LRMerwin .5264	4627-7	N	Spawned 4/6 w/ Female MT 15-6
3/17/2015	Tangle Net	M	77	BC9607E	TN15-17	LRMerwin .9101	4627-8	N	Spawned 4/6 w/ Female TN 15-33
3/17/2015	Tangle Net	F	60	BC96065	TN15-19	Coweeman .5818	4627-10	Y	Spawned 4/20 w/ male TN15-28
3/17/2015	Tangle Net	M	72	BC96080	TN15-21	LRMerwin .8324	4627-12	Y	Spawned 4/1 w/ Female MT15-12
3/17/2015	Tangle Net	M	77	BC960A0	TN15-23	Germany cr. .9336	4627-14	Y	
3/24/2015	Tangle Net	F	85	BC9607A	TN15-26	LRMerwin .9052		Y	Tangle Net brought in Spawned Out
3/24/2015	Tangle Net	M	91	BC960A7	TN15-28	LRCedar .8113		Y	Spawned 4/20 w/ female TN15-19
3/24/2015	Tangle Net	M	72	BC960A4	TN15-29	LRMerwin .9868		Y	Spawned 4/20 w/ female MT15-9
3/24/2015	Tangle Net	F	84	BC960AC	TN15-31	LRMerwin .2528		Y	Scale Card 4628
3/26/2015	Merwin Trap	F	60	A241	MT15-8	LRMerwin .7864	4635-2	Y	Spawned 3/26 w/ Male MT15-1
3/28/2015	Merwin Trap	F	58	A21C	MT15-9	LRMerwin .4805 KalamW .2214	4635-3	Y	Spawned 4/20 w/ male TN15-29
3/28/2015	Merwin Trap	M	87	A211	MT15-10	LRMerwin .827	4635-4	Y	Spawned 4/20 w/ female MT15-18
3/30/2015	Tangle Net	F	86	BC96051	TN15-33	LRMerwin .5944	4628-4	Y	Spawned 4/6 w/ Male TN 15-17
3/30/2015	Tangle Net	M	92	BC9605F	TN15-34	Coweeman .5601	4628-5	Y	Spawned 4/20 w/ female MT15-11
3/30/2015	Tangle Net	M	76	BC9609D	TN15-35	KalamW .5005 LRMerwin .2422	4628-7	N	Spawned 4/14 w/ female MT15-23
3/31/2015	Merwin Trap	F	65	A1FC	MT15-11	LRMerwin .8681	4635-5	Y	Spawned 4/20 w/ male TN15-34
4/1/2015	Merwin Trap	F	69	A24B	MT15-12	LRCedar .9745	4636-1	Y	Spawned 4/1 w/ Male TN15-21
4/1/2015	Merwin Trap	F	60	A1FE	MT15-13	LRMerwin .6105	4636-2	Y	Spawned 4/10 w/ Male MT 15-4
4/6/2015	Merwin Trap	F	82	A237	MT15-14	LRMerwin .9981	4636-3	Y	Spawned 4/6 w/ Male MT 15-7
4/7/2015	Merwin Trap	M	57	A227	MT15-15	LRMerwin .561	4636-4	Y	Spawned 5/4 w/ female MT15-33
4/7/2015	Merwin Trap	M	62	A23F	MT15-16	LRMerwin .4911 Coweeman .4154	4636-5	Y	Returned to river (poor condition)
4/8/2015	Merwin Trap	M	75	A1EE	MT15-17	LRCedar 0.4622 LRMerwin 0.3713	4636-6	Y	Spawned 5/4 w/ female MT15-34
4/10/2015	Merwin Trap	F	63	A225	MT 15-18	LRMerwin 0.9523	4636-7	Y	Spawned 4/20 w/ male MT15-10
4/13/2015	Merwin Trap	M	77	A1E7	MT 15-19	LRCedar 0.5836	4637-1	Y	Spawned 4/22 w/ female MT15-26
4/13/2015	Merwin Trap	F	74	A21B	MT 15-20	LRCedar 0.594	4637-2	Y	Spawned 4/14 w/ Male MT 15-2
4/14/2015	Merwin Trap	M	86	A209	MT15-21	LRCedar 0.9297	4637-3	Y	Spawned 4/20 w/ female MT15-21

Trap Date	Capture Method	Gender	Fork Length (cm)	Pit Tag #	DNA Sample #	DNA Results	Scale Card # - Position	Returned To River	Comments
4/14/2015	Merwin Trap	F	73	A24A	MT15-22	LRCedar 0.6375	4637-4	Y	Spawned 4/20 w/ male MT15-21
4/14/2015	Merwin Trap	F	64	A221	MT15-23	LRMerwin 0.9813	4637-5	Y	Spawned 4/14 w/ male TN15-35
4/15/2015	Merwin Trap	F	72	A1F5	MT15-24	Coweeman 0.7712 LRCedar 0.1663 LR	4637-6	Y	Spawned 4/15 w/ male MT15-5
4/21/2015	Merwin Trap	M	53	A212	MT15-25	KalamaW 0.7854 LRCedar 0.1038	4638-1	Y	SH:SU:16:W?
4/22/2015	Merwin Trap	F	57	A1FO	MT15-26	LRMerwin 0.5052 LR Cedar 0.3821	4638-2	Y	Spawned 4/22 w/ male MT15-19
4/22/2015	Merwin Trap	F	58	A222	MT15-27	LRMerwin 0.8703	4638-3	Y	Spawned 4/22 w/ male TN15-6
4/23/2015	Merwin Trap	M	60	A1E9	MT15-28	LRMerwin 0.8642	4638-4	N	Spawned 5/12 w/ female MT15-38
4/23/2015	Merwin Trap	F	54	A1E8	MT15-29	LRMerwin 0.3506 LrCedar 0.2158	4638-5	Y	
4/25/2015	Merwin Trap	M	92	A210	MT15-30	LRMerwin 0.9172	4638-6	Y	Spawned 5/4 w/ female MT15-31
4/27/2015	Merwin Trap	F	64	A1E5	MT15-31	LRMerwin 0.499 Coweeman 0.1785	30329-1	Y	Spawned 5/4 w/ male MT15-30
4/27/2015	Merwin Trap	F	62	A245	MT15-32	LRMerwin 0.4903 LRCedar 0.4619	30329-2	Y	Spawned 5/15 w/ male MT15-35
4/27/2015	Merwin Trap	F	59	A1EC	MT15-33	LRMerwin 0.9398	30329-3	Y	Spawned 5/4 w/ male MT15-15
4/27/2015	Merwin Trap	F	54	A22E	MT15-34	LRMerwin 0.8182 LRCedar 0.1218	30329-4	Y	Spawned 5/4 w/ male MT15-17
4/27/2015	Merwin Trap	M	55	A1F4	MT15-35	LRMerwin 0.8807	30329-5	Y	Spawned 5/15 w/ female MT15-32
4/28/2015	Tangle Net	F	82	BC96082	TN15-54	LRCedar 0.4558 LRMerwin 0.1974		Y	Spawned 5/12 W/ male MT-37
5/4/2015	Merwin Trap	M	64	A236	MT15-36	LRbotSUM 0.3564	30329-6	Y	
5/5/2015	Merwin Trap	M	85	A1F9	MT15-37	LRMerwin 0.9263	30329-7	Y	Spawned 5/12 w/ female TN15-54
5/5/2015	Merwin Trap	F	61	A1ED	MT15-38	LRCedar 0.4468 GermCr 0.17094	30329-8	Y	Spawned 5/12 w/ male MT15-32
5/11/2015	Merwin Trap	M	62	A23A	MT15-39	LRMerwin 0.9973	30330-1	Y	Spawned 5/15 w/ female MT15-41
5/12/2015	Merwin Trap	F	54	A223	MT15-40	LRCedar 0.9978	30330-2	Y	Spawned 5/22 w/ male MT15-44
5/12/2015	Merwin Trap	F	57	A20B	MT15-41	LRCedar 0.5403 EncdvR 0.1906	30330-3	Y	Spawned 5/15 w/ male MT15-39
5/14/2015	Merwin Trap	F	64	A1F6	MT15-42	LRCedar 0.9765 LRMerwin 0.1978	30330-4	Y	Egg goals met released 5/22
5/14/2015	Merwin Trap	F	48	A201	MT15-43	Cowman 0.319 LRMerwin 0.334	30330-5	Y	Egg goals met released 5/22
5/18/2015	Merwin Trap	M	67	A249	MT15-44	LRLewisR 0.9381 UPSaint 0.8998	30330-6	Y	Spawned 5/22 w/ female MT15-40
5/18/2015	Merwin Trap	F	63	A21A	MT15-45	LRMerwin 0.9327 LRCedar 0.0664	30330-7	Y	Egg goals met released 5/22
5/18/2015	Merwin Trap	F	75	A242	MT15-46	KalamaW 0.9791	30330-8	Y	Egg goals met released 5/22

APPENDIX B: Genetic Assignment Results from Lewis River Captures at Merwin Trap (MT), Cedar Creek (CC) and Tangle Netting (TN) - 2015

2015 Genetic Assignment of fish captured at the Merwin Trap, Tangle Netting, and Cedar Creek Weir.

Represents Hatchery Influence

Capture	Primary	P(1)	Secondary	P(2)	Tertiary	P(3)	4th	P(4)	NOTES
Tangle Netting	LRMerwin	0.3603	KalamW	0.3502	EFLewisR	0.1094	LRCedar	0.0907	
Tangle Netting	LRMerwin	0.9798	LRCedar	0.0154					
Tangle Netting	LRMerwin	0.9122	LRCedar	0.0612	GrRLC	0.0071	GermCr	0.006	
Tangle Netting	LRMerwin	0.8974	LRCedar	0.1006					
Tangle Netting	LRMerwin	0.845	LRCedar	0.0881	KalamW	0.0456	GrRLC	0.0161	
Tangle Netting	LRMerwin	0.7286	LRCedar	0.2663					
Tangle Netting	LRhatSum	0.9934							
Tangle Netting	SandyR	0.9767	Cowman	0.0101	LRMerwin	0.0066			
Tangle Netting	LRMerwin	0.5426	LRCedar	0.3723	KalamW	0.0405	Cowman	0.0235	
Tangle Netting	LRMerwin	0.993							
Tangle Netting	LRMerwin	0.5881	GermCr	0.2245	KalamSu	0.1128	LRCedar	0.0356	
Tangle Netting	LRMerwin	0.9623	GermCr	0.0237	LRCedar	0.0078			
Tangle Netting	LRMerwin	0.9019	LRCedar	0.0861	KalamW	0.0043			
Tangle Netting	LRMerwin	0.8736	LRCedar	0.0629	LRhatW	0.026	GermCr	0.0224	
Tangle Netting	LRMerwin	0.8352	LRCedar	0.1568					
Tangle Netting	LRMerwin	0.5264	LRCedar	0.2669	GermCr	0.0737	KalamW	0.0712	
Tangle Netting	LRMerwin	0.9101	LRCedar	0.0775	GermCr	0.0033			
Tangle Netting	LRMerwin	0.9184	LRCedar	0.0806					
Tangle Netting	Cowman	0.5818	LRMerwin	0.1642	GermCr	0.1468	SandyR	0.0357	
Tangle Netting	LRMerwin	0.8646	LRCedar	0.0514	GermCr	0.0279	Cowman	0.0249	
Tangle Netting	LRMerwin	0.7044	LRCedar	0.1437	MillCr	0.0788	GrRLC	0.0595	
Tangle Netting	LRMerwin	0.8324	LRCedar	0.1653					
Tangle Netting	GermCr	0.9336	LRCedar	0.0551	LRMerwin	0.0094			
Tangle Netting	LRMerwin	0.5862	GermCr	0.2189	LRCedar	0.1244	EFLewisR	0.0367	
Tangle Netting	LRMerwin	0.9052	GrRLC	0.032	LRCedar	0.0211	MillCr	0.018	
Tangle Netting	GermCr	0.753	LRMerwin	0.2086	LRCedar	0.0181	ElochR	0.0136	
Tangle Netting	LRCedar	0.8113	LRMerwin	0.104	GarysR	0.0621	Cowman	0.0093	
Tangle Netting	LRMerwin	0.9868	LRCedar	0.0113					
Tangle Netting	LRCedar	0.8945	LRMerwin	0.096					
Tangle Netting	LRMerwin	0.2528	KalamW	0.2157	Cowman	0.1675	KalamSu	0.0912	
Tangle Netting	LRMerwin	0.8088	GermCr	0.1145	LRCedar	0.0472	GrRLC	0.0089	
Tangle Netting	LRMerwin	0.5944	LRCedar	0.3843	GrRLC	0.012			
Tangle Netting	Cowman	0.5601	LRMerwin	0.2879	LRCedar	0.1273	GarysR	0.021	
Tangle Netting	KalamW	0.5005	LRMerwin	0.3432	GermCr	0.1179	LRCedar	0.0187	
Tangle Netting	LRMerwin	0.8198	LRCedar	0.1592	LRhatW	0.0206			
Tangle Netting	LRMerwin	0.8523	LRCedar	0.1053	KalamW	0.0199	GrRLC	0.0144	
Tangle Netting	LRMerwin	0.8055	LRCedar	0.0636	GermCr	0.0474	KalamW	0.0464	
Tangle Netting	LRCedar	0.5655	EFLewisR	0.1759	LRMerwin	0.1639	KalamSu	0.0288	
Tangle Netting	LRMerwin	0.8428	LRCedar	0.1043	GrRLC	0.021	KalamW	0.0157	
Tangle Netting	LRMerwin	0.9862	LRCedar	0.0121					
Tangle Netting	LRMerwin	0.8784	LRCedar	0.0884	KalamW	0.0237			
Tangle Netting	KalamW	0.4473	BigCr	0.3214	LRMerwin	0.1436	GrRLC	0.0326	
Tangle Netting	Cowman	0.6272	LRMerwin	0.2171	LRCedar	0.1319	KalamW	0.015	
Tangle Netting	LRMerwin	0.3029	Cowman	0.1961	ElochR	0.1896	GermCr	0.1182	
Tangle Netting	LRMerwin	0.6441	LRCedar	0.3036	KalamW	0.0502			
Tangle Netting	MillCr	0.9338	GermCr	0.0269	GrRLC	0.0193	ElochR	0.0073	
Tangle Netting	LRMerwin	0.9357	LRCedar	0.0244	ElochR	0.0122	EFLewisR	0.0107	
Tangle Netting	LRMerwin	0.3556	KalamW	0.3099	GermCr	0.2681	LRCedar	0.0496	
Tangle Netting	LRMerwin	0.7852	LRCedar	0.148	Cowman	0.0494	KalamW	0.0092	
Tangle Netting	LRMerwin	0.8134	LRCedar	0.1799					
Tangle Netting	LRCedar	0.3484	KalamW	0.2489	GermCr	0.2283	Cowman	0.1367	
Tangle Netting	LRMerwin	0.8957	LRCedar	0.0665	KalamW	0.0357			
Tangle Netting	LRCedar	0.4358	LRMerwin	0.1804	GrRLC	0.1565	KalamW	0.1354	
Merwin Trap	LRMerwin	0.6766	LRCedar	0.2299	KalamW	0.0836	KalamSu	0.0064	
Merwin Trap	GermCr	0.9922							
Merwin Trap	LRCedar	0.9297	GrRLC	0.0352	MillCr	0.0278			

Capture	Primary	P(1)	Secondary	P(2)	Tertiary	P(3)	4th	P(4)	NOTES
Merwin Trap	LRMerwin	0.8173	Cowman	0.1778					
Merwin Trap	NFToutR	0.8258	GrRLC	0.1666					
Merwin Trap	LRMerwin	0.5374	LRCedar	0.2687	Cowman	0.1309	KalamSu	0.0209	
Merwin Trap	LRMerwin	0.7864	KalamW	0.0934	Cowman	0.0671	LRCedar	0.0303	
Merwin Trap	LRMerwin	0.4803	KalamW	0.3214	LRCedar	0.1583	GermCr	0.0195	
Merwin Trap	LRMerwin	0.827	LRCedar	0.0533	KalamW	0.0382	Cowman	0.0342	
Merwin Trap	LRMerwin	0.8681	KalamW	0.0879	Cowman	0.0222	LRCedar	0.021	
Merwin Trap	LRCedar	0.9745	LRMerwin	0.0222					
Merwin Trap	LRMerwin	0.6105	GermCr	0.1724	LRCedar	0.1539	MillCr	0.0357	
Merwin Trap	LRMerwin	0.9981							
Merwin Trap	LRMerwin	0.561	EFLewisR	0.2112	LRCedar	0.0974	KalamW	0.0693	
Merwin Trap	LRMerwin	0.4911	Cowman	0.4154	LRCedar	0.0874			
Merwin Trap	LRCedar	0.4622	LRMerwin	0.2712	Cowman	0.1397	KalamW	0.0814	
Merwin Trap	LRMerwin	0.9523	LRCedar	0.0156	Cowman	0.014	GrRLC	0.0088	
Merwin Trap	LRCedar	0.5836	LRMerwin	0.3856	ElochR	0.0086	Clack	0.0054	
Merwin Trap	LRCedar	0.594	LRMerwin	0.2854	GermCr	0.0564	GrRLC	0.0439	
Merwin Trap	LRCedar	0.9297	Cowman	0.0504	LRMerwin	0.0126			
Merwin Trap	LRCedar	0.6375	LRMerwin	0.3371	Cowman	0.0243			
Merwin Trap	LRMerwin	0.9813	LRCedar	0.0079	GermCr	0.0023			
Merwin Trap	Cowman	0.7712	LRCedar	0.1663	LRMerwin	0.0249	GarysR	0.0134	
Merwin Trap	KalamW	0.7834	LRCedar	0.1028	EFLewisR	0.0799	LRMerwin	0.0152	
Merwin Trap	LRMerwin	0.5052	LRCedar	0.3821	CowlitzR	0.1013	Cowman	0.0065	
Merwin Trap	LRMerwin	0.8703	LRCedar	0.0629	LRhatSum	0.053	Cowman	0.0051	
Merwin Trap	LRMerwin	0.8642	LRCedar	0.1276					
Merwin Trap	LRMerwin	0.3506	LRCedar	0.3158	KalamSu	0.2134	SandyR	0.0786	
Merwin Trap	LRMerwin	0.9172	LRCedar	0.0596	GermCr	0.0166			
Merwin Trap	LRMerwin	0.499	Cowman	0.1785	GermCr	0.1294	LRCedar	0.1137	
Merwin Trap	LRMerwin	0.4903	LRCedar	0.4619	KlickSu	0.0385			
Merwin Trap	LRMerwin	0.9398	LRCedar	0.0321	Cowman	0.0141	GrRLC	0.0053	
Merwin Trap	LRMerwin	0.8182	LRCedar	0.1318	Cowman	0.0182	KalamW	0.0175	
Merwin Trap	LRMerwin	0.8807	GermCr	0.0437	Cowman	0.0325	ElochR	0.0168	
Merwin Trap	LRMerwin	0.5978	LRhatSum	0.2564	LRCedar	0.0463	KalamSu	0.0439	
Merwin Trap	LRMerwin	0.9263	KalamW	0.0407	LRCedar	0.0251			
Merwin Trap	LRCedar	0.4468	GermCr	0.1794	LRMerwin	0.1227	Cowman	0.1224	
Merwin Trap	LRMerwin	0.9973							
Merwin Trap	LRCedar	0.9978							
Merwin Trap	LRCedar	0.5403	SandyR	0.1996	GermCr	0.0649	KalamW	0.064	
Merwin Trap	LRCedar	0.5785	LRMerwin	0.1978	KalamSu	0.0966	Cowman	0.0843	
Merwin Trap	Cowman	0.319	LRMerwin	0.234	LRCedar	0.105	KalamW	0.0645	
Merwin Trap	EFLewisR	0.9381	LRMerwin	0.0327	Cowman	0.0107	KalamW	0.0094	
Merwin Trap	UpSSant	0.898	LRCedar	0.0664	Clack	0.0314			
Merwin Trap	KalamW	0.9791	KalamSu	0.0104	LRMerwin	0.005			
Merwin Trap	LRCedar	0.3277	KalamW	0.2722	LRMerwin	0.1866	GrRLC	0.1006	AD clip, BWT
Merwin Trap	LRMerwin	0.9908							AD clip, BWT
Merwin Trap	LRMerwin	0.8491	LRCedar	0.1088	GermCr	0.0323			AD clip, BWT
Merwin Trap	LRMerwin	0.3533	ElochHat	0.2591	KalamW	0.2055	LRCedar	0.1811	AD clip, BWT
Merwin Trap	LRMerwin	0.5359	LRhatW	0.1703	LRCedar	0.1299	ElochHat	0.1287	AD clip, BWT
Merwin Trap	LRMerwin	0.794	LRCedar	0.1487	KalamW	0.0359	GermCr	0.0122	AD clip, BWT
Merwin Trap	LRMerwin	0.9708	ElochR	0.0116	LRCedar	0.0067	MillCr	0.0035	AD clip, BWT
Merwin Trap	LRMerwin	0.4987	LRhatW	0.2321	LRCedar	0.1916	MillCr	0.0518	AD clip, BWT
Merwin Trap	LRMerwin	0.9879	LRCedar	0.0048					AD clip, BWT
Merwin Trap	LRMerwin	0.9879	LRCedar	0.0048					AD clip, BWT
Merwin Trap	LRMerwin	0.9471	LRCedar	0.0221	MillCr	0.0118	GrRLC	0.0043	AD clip, BWT
Merwin Trap	LRMerwin	0.6912	KalamW	0.0902	ElochR	0.0794	LRCedar	0.0722	AD clip, BWT
Merwin Trap	LRMerwin	0.7812	ElochR	0.0809	LRCedar	0.0564	GermCr	0.0355	AD clip, BWT
Merwin Trap	LRMerwin	0.8828	KalamW	0.0619	LRCedar	0.048			AD clip, BWT
Merwin Trap	KalamW	0.7671	LRMerwin	0.1573	LRCedar	0.0444	GrRLC	0.009	AD clip, BWT
Skamania H.	LRMerwin	0.4232	GermCr	0.2112	LRCedar	0.1425	MillCr	0.1026	AD clip, BWT (sample from head)
Cedar Creek	KlickSu	0.999							
Cedar Creek	KlickSu	0.986	BigCr	0.012					
Cedar Creek	LRCedar	0.973	Cowman	0.019					

Capture	Primary	P(1)	Secondary	P(2)	Tertiary	P(3)	4th	P(4)	NOTES
Cedar Creek	LRCedar	0.966	LRMerwin	0.033					
Cedar Creek	LRCedar	0.947	Cowman	0.016	LRMerwin	0.014	MillCr	0.010	
Cedar Creek	LRCedar	0.947	LRMerwin	0.039	KalamW	0.007			
Cedar Creek	KalamW	0.939	GrRLC	0.018	LRMerwin	0.017	SFTout	0.010	
Cedar Creek	LRCedar	0.909	LRMerwin	0.049	ElochR	0.020	GrRLC	0.007	
Cedar Creek	LRCedar	0.907	LRMerwin	0.072	GermCr	0.010	KalamSu	0.005	
Cedar Creek	LRMerwin	0.905	LRCedar	0.092					
Cedar Creek	LRCedar	0.898	MillCr	0.070	GrRLC	0.025			
Cedar Creek	LRhatW	0.890	Cowman	0.062	MillCr	0.031	LRMerwin	0.011	
Cedar Creek	LRCedar	0.889	MillCr	0.078	LRMerwin	0.024			
Cedar Creek	LRCedar	0.888	KalamW	0.106					
Cedar Creek	LRCedar	0.874	LRMerwin	0.067	KalamW	0.036	GrRLC	0.022	
Cedar Creek	LRCedar	0.870	LRMerwin	0.088	Cowman	0.025	SandyR	0.007	
Cedar Creek	LRMerwin	0.852	LRCedar	0.112	Cowman	0.013	KalamW	0.011	
Cedar Creek	LRCedar	0.851	KalamW	0.096	GrRLC	0.026	EFLewisR	0.009	
Cedar Creek	LRMerwin	0.850	LRCedar	0.062	GermCr	0.050	KalamW	0.016	
Cedar Creek	LRCedar	0.849	LRMerwin	0.054	GrRLC	0.044	SFTout	0.041	
Cedar Creek	LRCedar	0.845	LRMerwin	0.085	KalamW	0.062			
Cedar Creek	MillCr	0.830	LRMerwin	0.104	ElochR	0.036	KalamW	0.015	
Cedar Creek	GermCr	0.824	KalamW	0.068	MillCr	0.049	BigCr	0.033	
Cedar Creek	LRhatW	0.817	LRCedar	0.113	LRMerwin	0.032	KalamW	0.025	
Cedar Creek	LRCedar	0.809	LRMerwin	0.177	Cowman	0.009			
Cedar Creek	LRMerwin	0.804	LRCedar	0.133	Cowman	0.043	KalamW	0.009	
Cedar Creek	LRCedar	0.802	LRMerwin	0.083	ElochR	0.036	ElochHat	0.028	
Cedar Creek	LRCedar	0.790	LRMerwin	0.208					
Cedar Creek	MillCr	0.768	Cowman	0.099	KalamW	0.084	LRMerwin	0.020	
Cedar Creek	Cowman	0.766	LRCedar	0.143	ElochHat	0.031	LRMerwin	0.023	
Cedar Creek	LRCedar	0.750	LRMerwin	0.210	KalamW	0.010	GermCr	0.009	
Cedar Creek	LRCedar	0.736	LRMerwin	0.110	GrRLC	0.066	GermCr	0.065	
Cedar Creek	LRCedar	0.719	LRMerwin	0.144	MillCr	0.066	GrRLC	0.061	
Cedar Creek	LRCedar	0.719	LRMerwin	0.144	MillCr	0.066	GrRLC	0.061	
Cedar Creek	EFLewisR	0.715	LRMerwin	0.133	GermCr	0.089	KalamSu	0.024	
Cedar Creek	LRCedar	0.704	MillCr	0.163	LRMerwin	0.094	SFTout	0.027	
Cedar Creek	LRCedar	0.696	LRMerwin	0.184	KalamW	0.091	Cowman	0.013	
Cedar Creek	LRMerwin	0.688	Cowman	0.114	ElochR	0.096	KalamW	0.039	
Cedar Creek	LRMerwin	0.688	LRCedar	0.219	GermCr	0.023	KalamW	0.022	
Cedar Creek	LRCedar	0.684	KalamW	0.297	ElochHat	0.011			
Cedar Creek	LRMerwin	0.675	KalamW	0.148	LRCedar	0.084	MillCr	0.051	
Cedar Creek	EFLewisR	0.667	KalamSu	0.262	GrRLC	0.046	LRCedar	0.024	
Cedar Creek	LRMerwin	0.661	MillCr	0.161	LRCedar	0.074	KalamSu	0.052	
Cedar Creek	LRCedar	0.653	KalamW	0.140	LRMerwin	0.129	MillCr	0.019	
Cedar Creek	LRCedar	0.651	LRMerwin	0.329	KalamW	0.015			
Cedar Creek	LRCedar	0.648	LRMerwin	0.276	LRhatW	0.048	Cowman	0.017	
Cedar Creek	LRhatW	0.597	LRCedar	0.231	BigCr	0.144	Cowman	0.012	
Cedar Creek	LRCedar	0.596	GermCr	0.297	KalamW	0.067	GrRLC	0.030	
Cedar Creek	SFTout	0.577	LRMerwin	0.189	GrRLC	0.124	ElochR	0.060	
Cedar Creek	LRMerwin	0.577	MillCr	0.223	KalamW	0.095	LRCedar	0.056	
Cedar Creek	LRCedar	0.576	MillCr	0.178	LRMerwin	0.121	KalamW	0.052	
Cedar Creek	LRCedar	0.574	LRMerwin	0.214	Cowman	0.197	MillCr	0.008	
Cedar Creek	LRMerwin	0.567	LRCedar	0.423					
Cedar Creek	GermCr	0.560	KalamSu	0.270	LRMerwin	0.058	KalamW	0.030	
Cedar Creek	LRCedar	0.547	LRMerwin	0.188	Cowman	0.168	EFLewisR	0.050	
Cedar Creek	LRMerwin	0.544	LRCedar	0.317	Cowman	0.078	KalamW	0.021	
Cedar Creek	LRCedar	0.543	LRMerwin	0.349	Cowman	0.055	MillCr	0.024	
Cedar Creek	LRCedar	0.538	LRMerwin	0.333	Cowman	0.118	Clack	0.009	
Cedar Creek	MillCr	0.534	EFLewisR	0.332	KalamSu	0.067	GermCr	0.039	
Cedar Creek	LRCedar	0.529	LRMerwin	0.277	GermCr	0.135	ElochR	0.035	
Cedar Creek	LRCedar	0.519	KalamW	0.359	LRMerwin	0.037	Cowman	0.017	
Cedar Creek	LRCedar	0.518	LRhatW	0.188	LRhatSum	0.161	LRMerwin	0.082	
Cedar Creek	LRMerwin	0.507	LRCedar	0.307	Cowman	0.136	MillCr	0.018	
Cedar Creek	MillCr	0.499	LRCedar	0.238	LRMerwin	0.126	ElochR	0.060	

Capture	Primary	P(1)	Secondary	P(2)	Tertiary	P(3)	4th	P(4)	NOTES
Cedar Creek	LRMerwin	0.493	LRCedar	0.357	SandyR	0.084	ElochR	0.045	
Cedar Creek	KalamW	0.484	LRMerwin	0.305	GermCr	0.167	SandyR	0.023	
Cedar Creek	MillCr	0.482	LRMerwin	0.336	KalamW	0.139	Cowman	0.018	
Cedar Creek	LRMerwin	0.465	LRCedar	0.317	KalamSu	0.184	GermCr	0.012	
Cedar Creek	LRMerwin	0.460	LRCedar	0.283	GrRLC	0.114	ElochR	0.067	
Cedar Creek	LRMerwin	0.449	LRCedar	0.302	Cowman	0.223	Clack	0.023	
Cedar Creek	MillCr	0.448	ElochR	0.402	GermCr	0.122	LRCedar	0.021	
Cedar Creek	LRCedar	0.425	KalamSu	0.217	LRMerwin	0.143	GrRLC	0.096	
Cedar Creek	LRCedar	0.423	KalamW	0.295	LRMerwin	0.112	ElochR	0.080	
Cedar Creek	LRCedar	0.415	LRMerwin	0.354	LRhatW	0.179	EFLewisR	0.041	
Cedar Creek	MillCr	0.415	LRMerwin	0.388	LRCedar	0.178	KalamW	0.012	
Cedar Creek	KlickSu	0.398							

APPENDIX C – Winter Steelhead Spawning Crosses – 2015

2015 Spawning crosses at the Merwin Hatchery

	Spawn Date	Capture Date	Capture Method	Gender	Fork Length (cm)	DNA Sample #	DNA Results
1	3/26/2015	2/9/2015	Merwin Trap	M	60	MT15-1	LRMerwin .8011
		3/26/2015	Merwin Trap	F	60	MT15-8	LRMerwin .7864
2	4/20/2015	3/28/2015	Merwin Trap	M	87	MT15-10	LRMerwin .827
		4/10/2015	Merwin Trap	F	63	MT 15-18	LRMerwin 0.9523
3	4/14/2015	2/16/2015	Merwin Trap	M	56	MT15-2	LRMerwin .6766
		4/13/2015	Merwin Trap	F	74	MT 15-20	LRCedar 0.594
4	4/22/2015	2/17/2015	Tangle Net	M	71	TN15-6	LRMerwin .7286
		4/22/2015	Merwin Trap	F	58	MT15-27	LRMerwin 0.8703
5	4/10/2015	2/21/2015	Merwin Trap	M	69	MT15-4	LRMerwin .9297
		4/1/2015	Merwin Trap	F	60	MT15-13	LRMerwin .6105
6	4/15/2015	2/22/2015	Merwin Trap	M	89	MT15-5	LRMerwin .8173
		4/15/2015	Merwin Trap	F	72	MT15-24	Coweeman 0.7712 LRCedar 0.1663LR
7	4/6/2015	3/17/2015	Tangle Net	M	91	TN15-16	LRMerwin .5264
		3/3/2015	Merwin Trap	F	63	MT15-6	NFToutleR .8258
8	4/1/2015	3/10/2015	Tangle Net	M	76	TN15-15	LRMerwin .8352
		3/10/2015	Tangle Net	F	81	TN15-14	LRMerwin .8736
9	4/6/2015	3/14/2015	Merwin Trap	M	75	MT15-7	LRMerwin .5374
		4/6/2015	Merwin Trap	F	82	MT15-14	LRMerwin .9981
10	4/6/2015	3/17/2015	Tangle Net	M	77	TN15-17	LRMerwin .9101
		3/30/2015	Tangle Net	F	86	TN15-33	LRMerwin .5944
11	4/20/2015	3/24/2015	Tangle Net	M	91	TN15-28	LRCedar .8113
		3/17/2015	Tangle Net	F	60	TN15-19	Coweeman .5818
12	4/1/2015	3/17/2015	Tangle Net	M	72	TN15-21	LRMerwin .8324
		4/1/2015	Merwin Trap	F	69	MT15-12	LRCedar .9745
13	4/20/2015	3/24/2015	Tangle Net	M	72	TN15-29	LRMerwin .9868
		3/28/2015	Merwin Trap	F	58	MT15-9	LRMerwin .4803 KalamW .3214
14	4/20/2015	3/30/2015	Tangle Net	M	92	TN15-34	Coweeman .5601 LRMerwin .2879
		3/31/2015	Merwin Trap	F	65	MT15-11	LRMerwin .8681
15	4/14/2015	3/30/2015	Tangle Net	M	76	TN15-35	KalamW .5005 LRMerwin .3432
		4/14/2015	Merwin Trap	F	64	MT15-23	LRMerwin 0.9813
16	5/4/2015	4/7/2015	Merwin Trap	M	57	MT15-15	LRMerwin .561
		4/27/2015	Merwin Trap	F	59	MT15-33	LRMerwin 0.9398
17	5/4/2015	4/8/2015	Merwin Trap	M	75	MT15-17	LRCedar 0.4622 LRMerwin 0.2712
		4/27/2015	Merwin Trap	F	54	MT15-34	LRMerwin 0.8182 LRCedar 0.1318
18	4/22/2015	4/13/2015	Merwin Trap	M	77	MT 15-19	LRCedar 0.5836
		4/22/2015	Merwin Trap	F	57	MT15-26	LRMerwin 0.5052LR Cedar 0.3821

	Spawn Date	Capture Date	Capture Method	Gender	Fork Length (cm)	DNA Sample #	DNA Results
19	4/20/2015	4/14/2015	Merwin Trap	M	86	MT15-21	LRCedar 0.9297
		4/14/2015	Merwin Trap	F	73	MT15-22	LRCedar 0.6375
20	5/12/2015	4/23/2015	Merwin Trap	M	60	MT15-28	LRMerwin 0.8642
		5/5/2015	Merwin Trap	F	61	MT15-38	LRMerwin 0.1227
21	5/4/2015	4/25/2015	Merwin Trap	M	92	MT15-30	LRMerwin 0.9172
		4/27/2015	Merwin Trap	F	64	MT15-31	GermCr 0.1294
22	5/15/2015	4/27/2015	Merwin Trap	M	55	MT15-35	LRMerwin 0.8807
		4/27/2015	Merwin Trap	F	62	MT15-32	LRMerwin 0.4903 LRCedar 0.4619
23	5/12/2015	5/5/2015	Merwin Trap	M	85	MT15-37	LRMerwin 0.9263
		4/28/2015	Tangle Net	F	82	TN15-54	LRCedar 0.4358 LRMerwin 0.1804
24	5/15/2015	5/11/2015	Merwin Trap	M	62	MT15-39	LRMerwin 0.9973
		5/12/2015	Merwin Trap	F	57	MT15-41	LRCedar 0.5403 SandyR 0.1996
25	5/22/2015	5/18/2015	Merwin Trap	M	67	MT15-44	EFLewisR 0.9381
		5/12/2015	Merwin Trap	F	54	MT15-40	LRCedar 0.9978

APPENDIX D – NOR winter steelhead spawning log – 2015

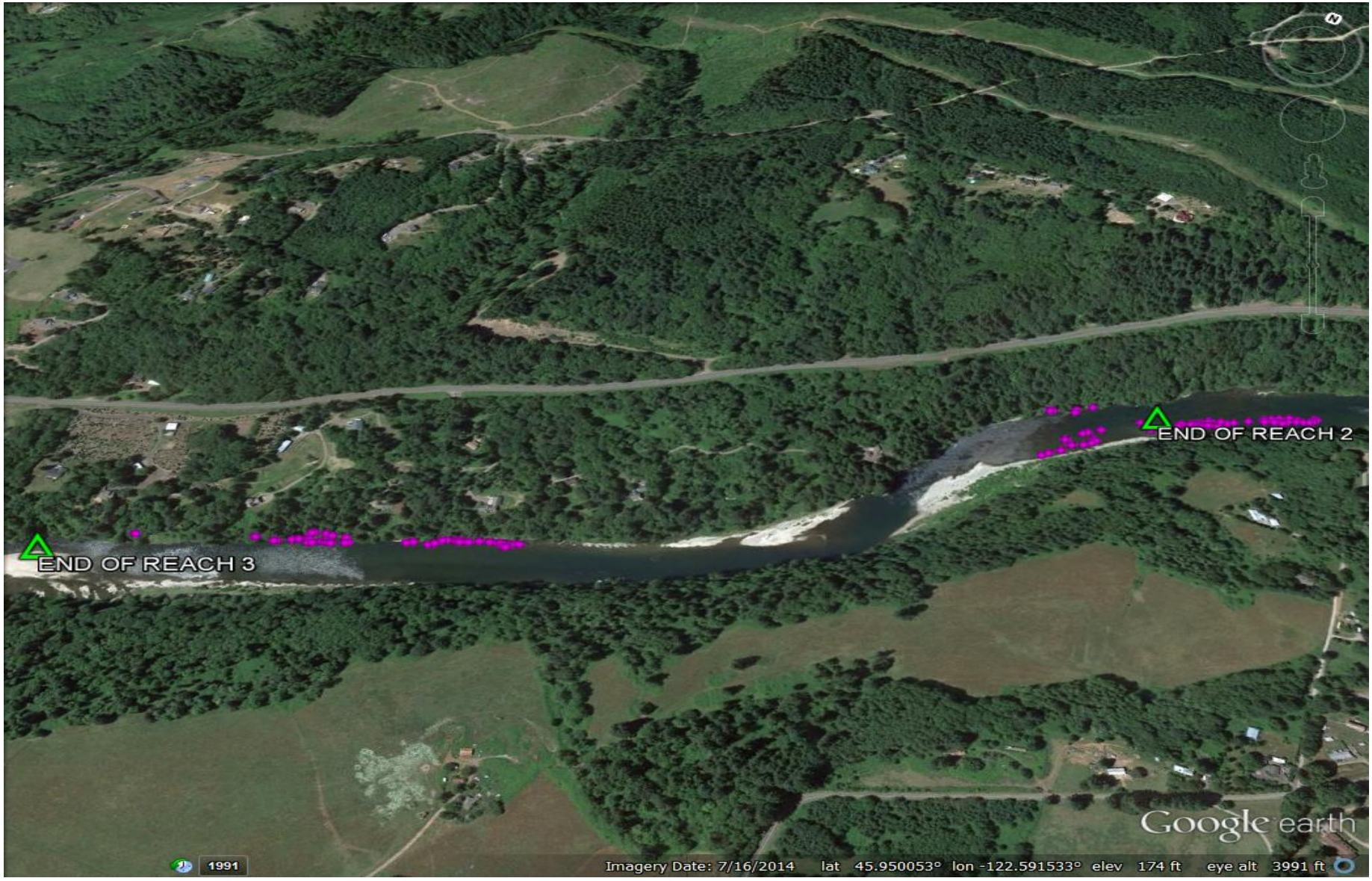
Wild Winter Steelhead Spawning Log 2015 (needs updating from WDFW)

Spawn Date	Female & Male Release Date	Female DNA #	Male DNA #	Total Egg Weight w/ovarian (grams)	Total Egg Weight (g)	Estimate Eggs/Female	Eyed Egg Eggs/LB	Eyed Eggs On-Hand	Dead Eggs	Actual Eggs/Female	Percent of Egg Loss	Estimate # Fry Ponded
3/26/2015	3/26/2015	MT 15-8	MT 15-1	772	722	4921	2781	4950	77	5027	1.53%	4901
4/1/2015	4/1/2015	MT 15-12	TN 15-21	436	386	2631	1848	1940	67	2007	3.34%	1921
4/1/2015	4/1/2015	TN 15-14	TN 15-15	961	911	6209	2574	5075	832	5907	14.08%	5024
4/6/2015	4/6/2015	MT 15-14	MT 15-7	1023	973	6632	2052	4851	167	5018	3.33%	4802
4/6/2015	4/6/2015	TN 15-33	TN 15-17	975	925	6305	1943	3858	421	4279	9.84%	3819
4/6/2015	4/6/2015	MT 15-6	TN 15-16	548	498	3394	2842	3549	60	3609	1.66%	3514
4/10/2015	4/10/2015	MT 15-13	MT 15-4	571	521	3551	2746	2829	620	3449	17.98%	2801
4/13/2015	4/13/2015	MT 15-20	MT 15-2	1026	976	6652	2137	4804	482	5286	9.12%	4756
4/14/2015	4/14/2015	MT 15-23	TN 15-35	458	408	2781	2693	3151	91	3242	2.81%	3119
4/15/2015	4/15/2015	MT 15-24	MT 15-5	931	881	6005	2197	4789	93	4882	1.90%	4741
4/20/2015	4/20/2015	MT 15-22	MT 15-21	670	620	4226				0		0
4/20/2015	4/20/2015	MT 15-18	MT 15-10	712	662	4512				0		0
4/20/2015	4/20/2015	MT 15-11	TN 15-34	779	729	4969				0		0
4/20/2015	4/20/2015	MT 15-9	TN 15-29	538	488	3326				0		0
4/20/2015	4/20/2015	TN 15-19	TN 15-28	371	321	2188				0		0
4/22/2015	4/22/2015	MT 15-26	MT 15-19	418	368	2508				0		
4/22/2015	4/22/2015	MT 15-27	TN 15-6	719	669	4560				0		0
5/4/2015	5/4/2015	MT 15-31	MT 15-30	655	605	4124				0		0
5/4/2015	5/4/2015	MT 15-34	MT 15-17	594	544	3708				0		0
5/4/2015	5/4/2015	MT 15-33	MT 15-15	685	635	4328				0		0
5/12/2015	5/12/2015	TN 15-54	MT 15-37	1260	1210	8247				0		0
5/12/2015	5/12/2015	MT 15-38	MT 15-28	473	423	2883				0		0
5/15/2015	5/15/2015	MT 15-32	MT 15-35	648	598	4076				0		0
5/15/2015	5/15/2015	MT 15-41	MT 15-39	604	554	3776				0		0

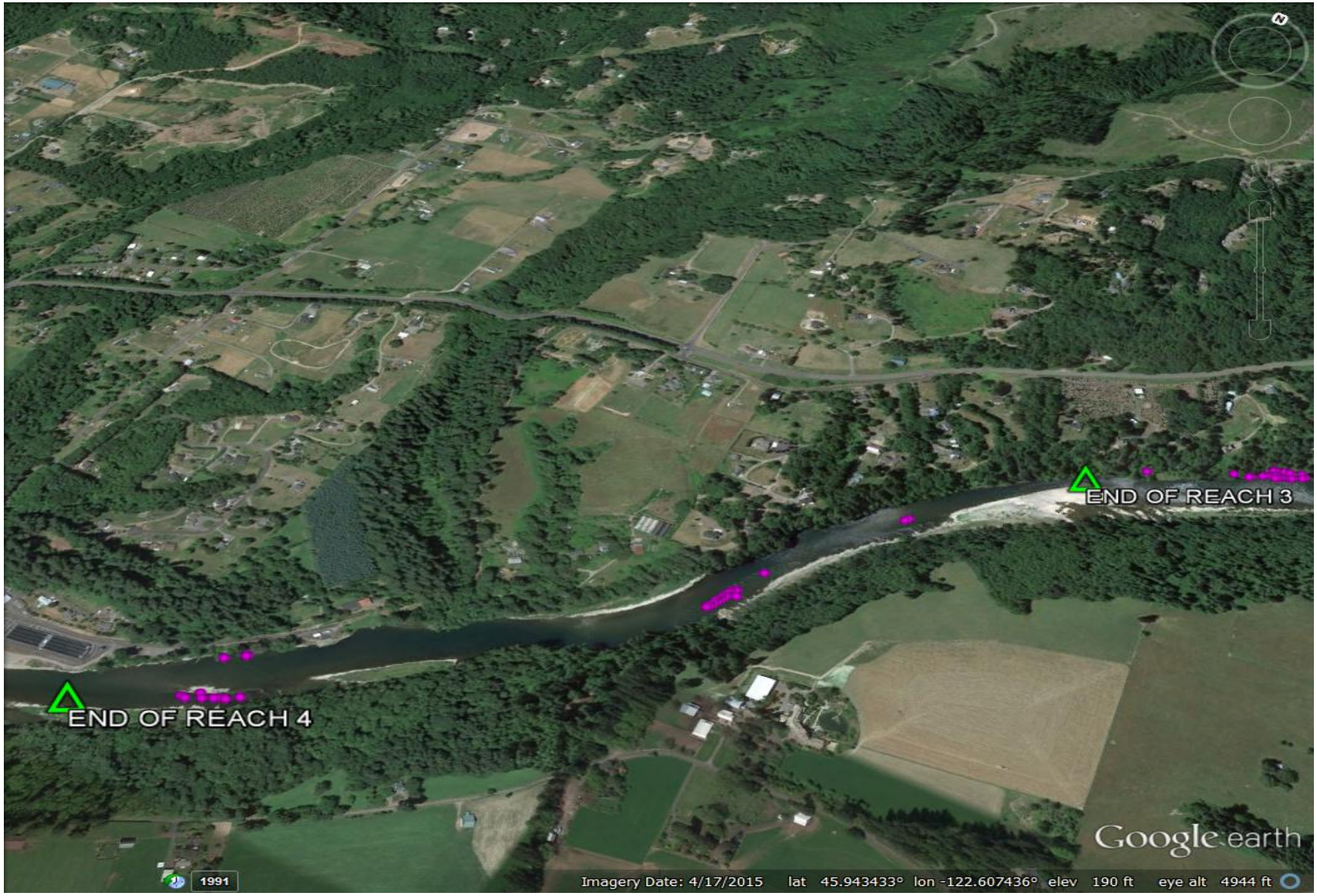
APPENDIX E - Steelhead Redd Locations, Lewis River, WA – 2015

APPENDIX E. Redds identified in Reach 1

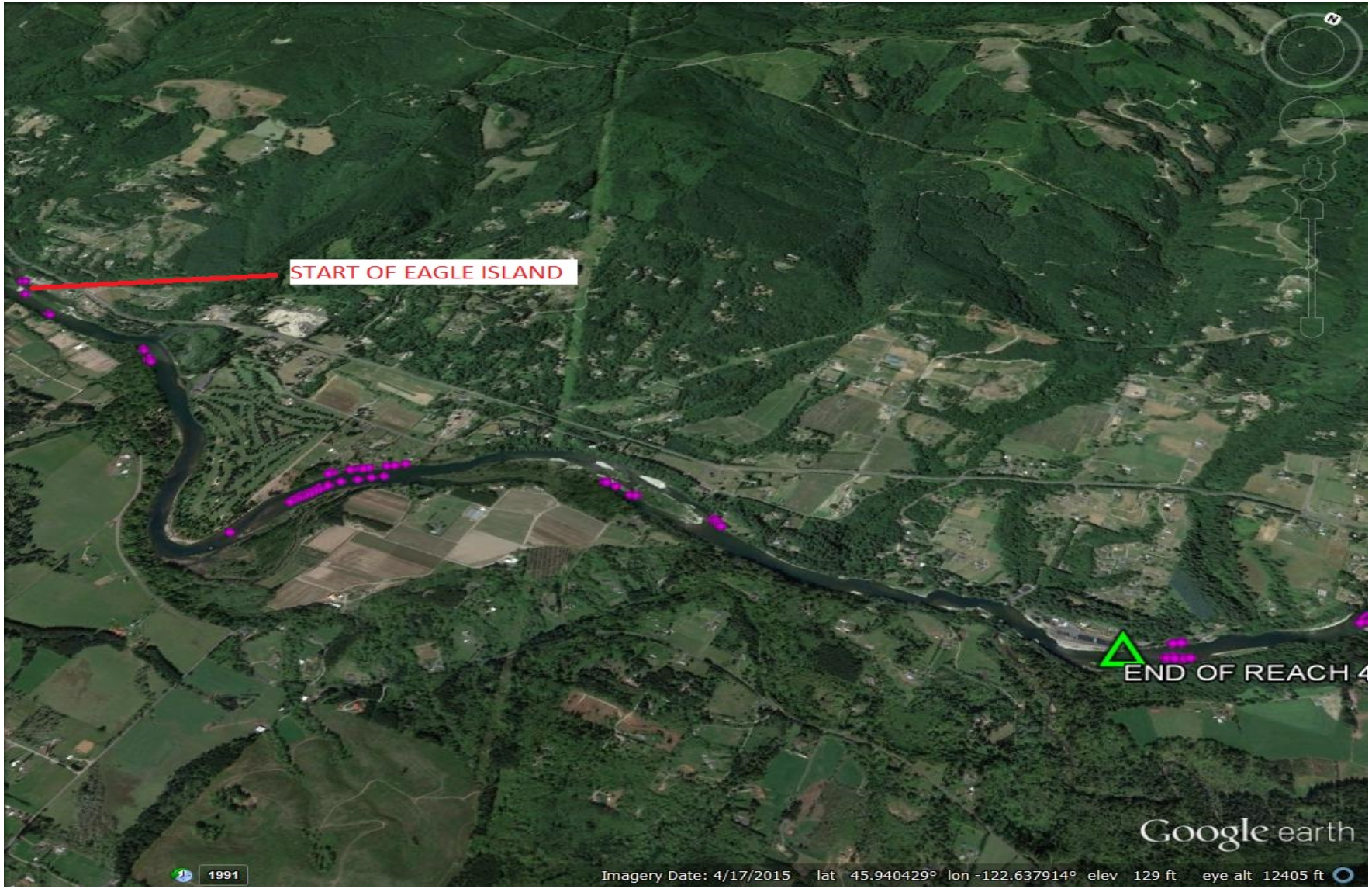
APPENDIX E. Steelhead Redds identified in Reach 2



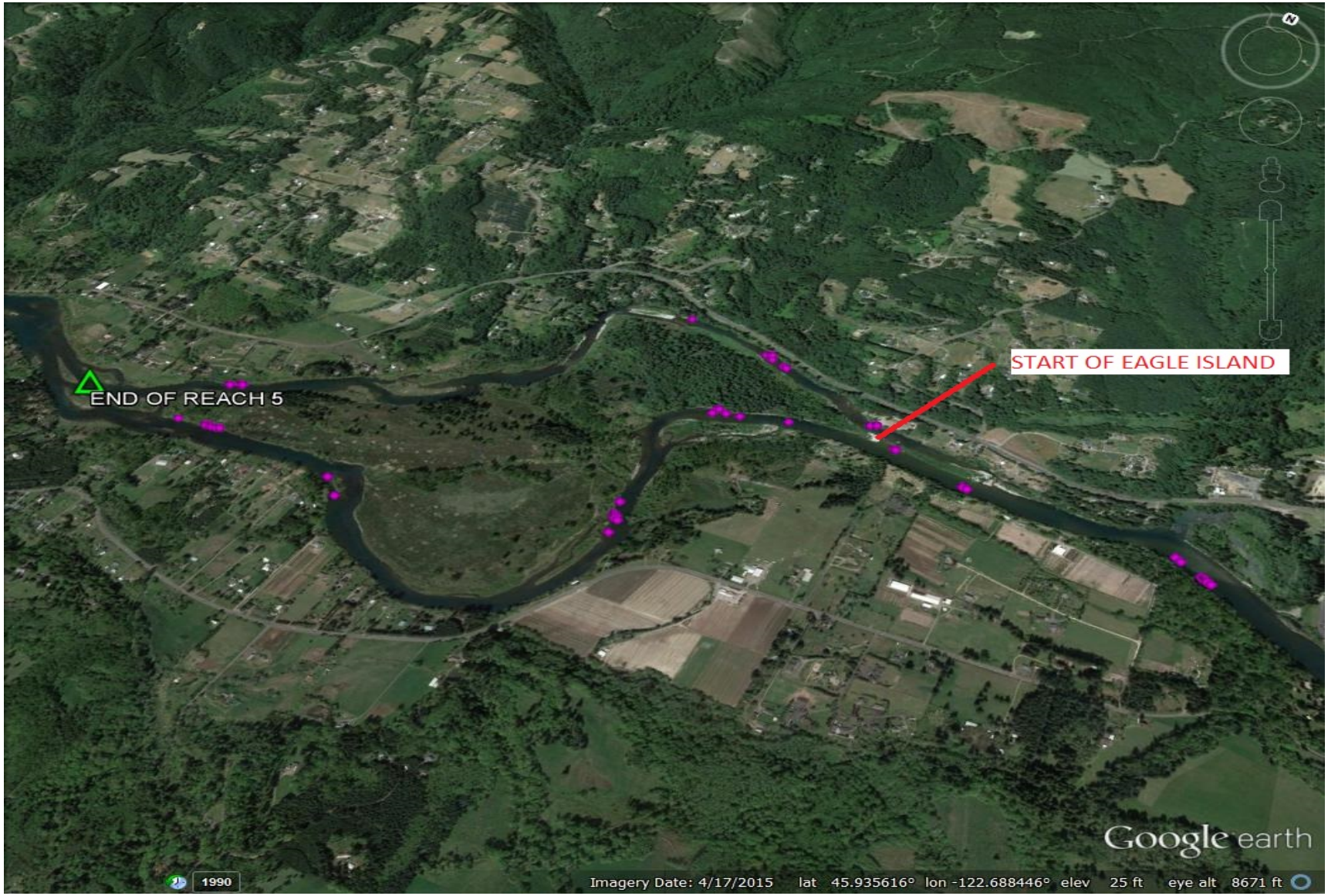
APPENDIX E. Redds identified in Reach 3



APPENDIX E. Late winter steelhead redds identified in Reach 4



APPENDIX E. Late winter steelhead redds identified in Reach 5 (1 of 2)



APPENDIX E. Late winter steelhead redds identified in Reach 5 (2 of 2)

APPENDIX F – Revised estimates of 2013 and 2014 coho escapement from tagged carcass surveys in the lower Lewis River.

ENVIRONMENTAL & STATISTICAL CONSULTANTS
456 SW Monroe Ave, Suite 106, Corvallis, OR 97333
Phone: 541-738-6198 ◆ www.west-inc.com

Date: September 29, 2015
To: Erik Lesko (PacifiCorp)
From: Leigh Ann Starcevich (WEST, Inc.) and Jason Shappart (Meridian Environmental, Inc.)
Re: Revised Estimates of 2013 and 2014 Coho Adult Escapement from Tagged Carcass Surveys in the Lower Lewis River

Introduction

Coho salmon spawning surveys (including carcass tagging) are conducted annually from mid-October through January by Meridian Environmental, Inc. (Meridian) for PacifiCorp to provide the basis for estimating escapement in the mainstem North Fork Lewis River downstream of Merwin Dam to the downstream end of Eagle Island. The area of interest is divided into 5 reaches ranging from 0.57 to 7.30 miles long, previously defined by Washington Department of Fish and Wildlife (WDFW). Surveys are conducted multiple days per week between mid-October and the end of January.

Coho carcasses are identified and tagged with an individually numbered plastic disk behind the gills (two tags per carcass) so that re-sighting probabilities of tagged carcasses do not differ from untagged carcasses. The tagged carcass is then returned to the river in flowing water to deposit naturally downriver. On successive survey occasions, carcasses are counted by reach. Once re-sighted, tagged carcasses are recorded then tails and tags are removed and carcasses are deposited adjacent to the river. Therefore, once a carcass is re-sighted, it is removed from the tagged population.

In this memo, the methods and results of an analysis to estimate coho salmon escapement are outlined. This memo updates the results reported on April 8, 2015.

Statistical Methods

Analysis tools developed for a similar analysis used by California Department of Fish and Wildlife (Bergman et al. 2012) were applied to the carcass data from the Lower Lewis River surveys. These tools account for loss-on-capture when carcasses are re-sighted then removed from the marked population. In the R statistical environment (2014), the *rma* package (McDonald 2015) was used to apply the super-population parameterization (Schwarz and Arnason 1996) of the Jolly-Seber model to estimate the total escapement in the population. Escapement is quantified by Schwarz and Arnason (1996) as the total number of gross "births" in the area of interest, which includes coho present at the beginning of the study, those that move into the study area during the monitoring period, and those that do not survive to the end of the monitoring period.

Intercept-only models were used for capture and survival probabilities because preliminary modeling indicated that both the 2013 and 2014 data were too sparse for time-dependent models. A nonparametric bootstrap (Manly 2007) was used to obtain the standard error and 95%-confidence intervals on total escapement.

Results

The results of the 2013 and 2014 carcass surveys are provided in Table 1. A total of 328 carcasses were marked in 2013 and 41 were re-sighted over 27 sampling occasions. In 2014, 18 of 431 marked carcasses were re-sighted over 23 sampling occasions. Escapement (i.e. total carcasses) was estimated in 2013 as 1970 (bootstrap 95%-CI: 1523, 2679) and 7805 (bootstrap 95%-CI: 5172, 13186) in 2014. The coefficient of variation for estimated escapement was 0.15 in 2013 and 0.27 in 2014.

Table 1. Estimated coho spawner escapement by year to the mainstem North Fork Lewis River from Merwin Dam to the downstream end of Eagle Island, with 95%-confidence intervals.

Year	Number of marked carcasses	Number (%) of captured carcasses	Est. Gross Population Size	Bootstrap SE	95%-Confidence Interval	CV
2013	328	41 (12.5%)	1970	297	(1523, 2679)	0.15
2014	431	18 (4.2%)	7805	2106	(5172, 13186)	0.27

Discussion

Incorporating loss-on-capture reduced the estimates of escapement from those reported in the April 8, 2015 analysis report. Note that the analysis does not need to account for observed carcasses that were not marked. The mark-resight methods applied in this analysis do not require that all encountered carcasses be marked.

The coefficient of variation was lower for the 2013 estimate of escapement (0.15) than for the 2014 escapement estimate (0.27). Several factors may influence the precision of the escapement estimates. First, only 4.2% of the marked carcasses were resighted in 2014 compared to a resighting rate of 12.5% in 2013. Second, 27 sampling occasions were used in 2013 compared to 23 occasions in 2014. Both of these parameters can be highly influenced by environmental conditions. For example, when flows are too high and visibility too low, surveys are not conducted. This was the primary reason for fewer sampling occasions in 2014 compared to 2013. In addition, high flows likely reduced carcass detection probability due to depth and decreased water clarity. Flows were substantially higher during the 2014 coho spawning survey season (mid-October through January) compared to the 2013 survey season (Figure 1).

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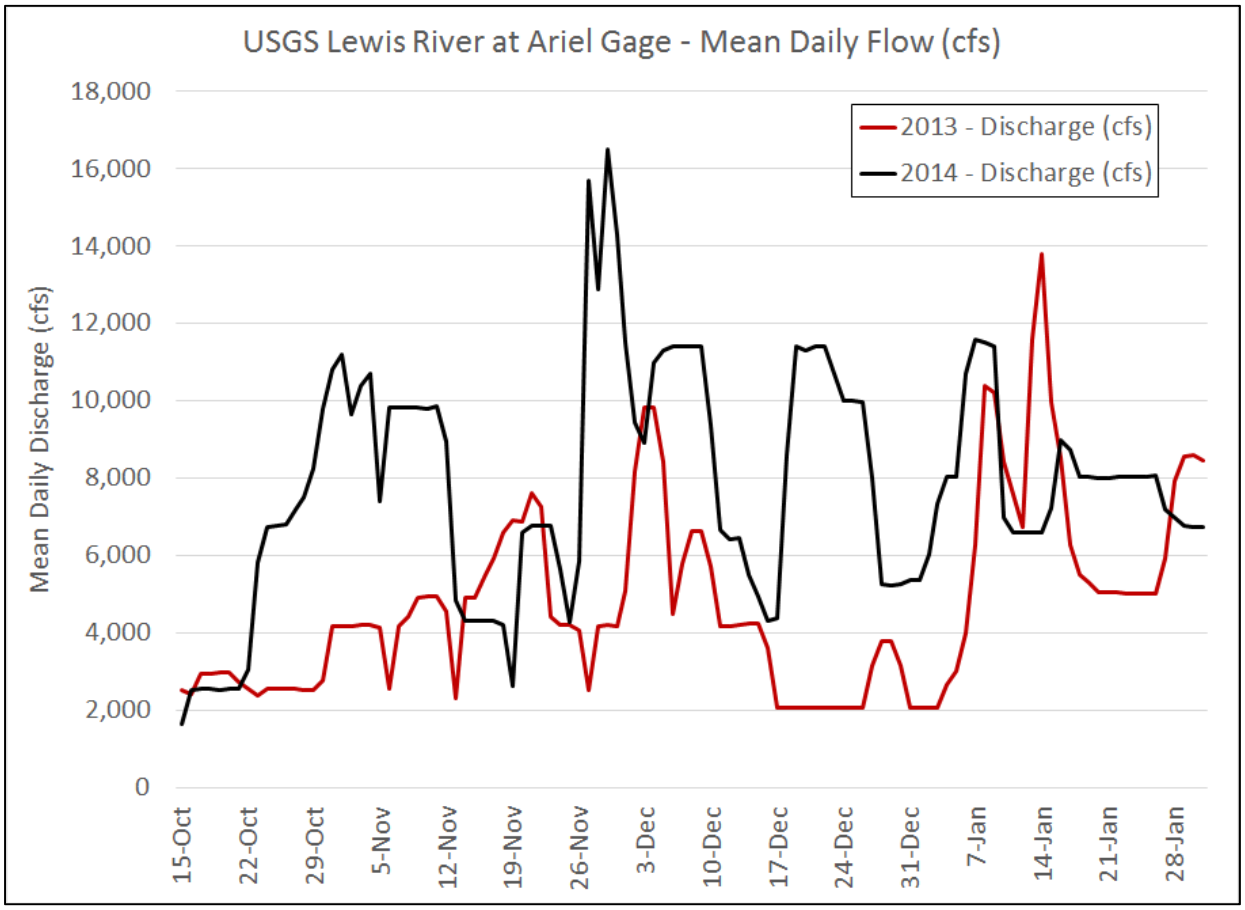

Figure 1. USGS Lewis River at Ariel gage – mean daily flow (cfs).

Precision of escapement estimates may be improved by increasing the number of marked carcass re-sight rate, and/or sampling occasions. The Meridian spawning survey crew conducts mainstem Lewis River surveys four days per week during the majority of the coho spawning time. However, environmental variables such as flow may limit the number of surveyable days. PacifiCorp conducts river drawdowns on Wednesdays during the coho and fall Chinook spawning survey season at the request of WDFW to improve WDFW's ability to recover fall Chinook carcasses. During 2013 and 2014, Meridian specifically avoided conducting coho surveys on Wednesday drawdowns at the request of WDFW. The data analysis above suggests that coho carcass recovery rates may be improved during lower flows. Conducting coho carcass surveys during Wednesday drawdowns may increase carcass recovery rates and thereby improve the precision of total carcass estimates.

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Schwarz, C.J., and A.N. Arnason. 1996. A general method for analysis of capture-recapture experiments in open populations. *Biometrics* 52:860-873.

APPENDIX G - Estimates of 2015 coho escapement from tagged carcass surveys in the lower Lewis River.

Meridian Environmental, Inc.

Environmental Sciences
Regulatory Planning
Project Management

Memorandum

To: Erik Lesko, PacifiCorp

From: Jason Shappart, Fisheries Scientist

Date: February 25, 2016

Re: NF Lewis River downstream of Merwin Dam – spring Chinook and coho spawning survey results (September 2015 through January 2016)

Introduction

Spring Chinook and coho salmon spawning surveys are conducted annually from September through January by Meridian Environmental, Inc. (Meridian) for PacifiCorp to provide the basis for estimating spawning escapement in the North Fork Lewis River downstream of Merwin Dam. Spring Chinook surveys are conducted from September through mid-October and coho surveys are conducted from mid-October through January. The survey area of the mainstem North Fork Lewis River is divided into five index reaches ranging from 0.57 to 7.30 miles long encompassing the area from the boat barrier downstream of Merwin Dam to the downstream end of Eagle Island (10.84 miles total length). Reaches were defined by Washington Department of Fish and Wildlife (WDFW). North Fork Lewis River tributary coho survey reaches are defined annually by WDFW using a GRTS sample design, drawing about five miles total of tributary survey reaches for each survey season. All surveys are conducted on a weekly basis as environmental conditions allow (flow, turbidity, etc.). This memorandum summarizes spring Chinook and coho spawning survey results for the period from September 2015 through January 2016.

Survey Conditions

Spring Chinook Survey (September through mid-October)

Western Washington experienced a drought during 2015, followed by intense and extended precipitation from late fall to early winter. Flow conditions in the North Fork Lewis River were lower than the normal minimum flow during the spring Chinook spawning survey period (as approved through agency consultation). In prior years, a jet boat was used to conduct the spring Chinook surveys. Flows were too low to use a jet boat to effectively and safely conduct surveys during the entire spring Chinook survey season. Therefore, non-motorized float craft (raft and drift boat) were used to conduct all spring Chinook surveys. Two boats were used for each survey, one boat surveying along each side of the river.

All five reaches need to be surveyed within a one day period. Due to the low flow conditions and relatively large number of spring Chinook spawners, it was not possible to collect all data and cover the entire survey length within a 1-day period. Therefore, Reach 5 was truncated (Figure 1) to allow a complete survey of all reaches within a 1-day period (6.45 miles total length instead of 10.84 miles). The downstream end of Reach 5 was terminated at the Golf Course boat ramp, the furthest downstream accessible boat ramp available

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during the 2015 survey season (Figure 1). Historically, few spring Chinook have been observed spawning downstream of the Golf Course boat ramp. Note that the Eagle Island boat ramp is slightly farther downstream, but was closed for use during the survey period due to low water conditions.

Coho Survey (mid-October through January)
Minimum flows increased in mid-October, which allowed for jet boat use. Therefore, all coho spawning surveys were conducted via jet boat and all five reaches were surveyed during a single day for each survey, ending at the downstream end of Eagle Island (10.84 miles total). Intense precipitation resulted in spill at Merwin Dam for a brief period in November and extended unsurveyable conditions persisted due to spill for a three week period in December (Figure 2). As a result, mainstem coho surveys were only completed during 12 of the 15 weeks during the survey season. Most tributary reaches were only surveyable during 10 of the 15 weeks during the survey season, being too turbid to survey during a three week period in December, then again during the end of January.

Results

Spring Chinook
Carcass and redd counts were much larger in 2015 than during the prior two years (over 10 times greater). A total of 1,485 spring Chinook redds were counted, primarily in reaches 2, 3, and 4. A total of 792 carcasses were counted, about 84 percent being of hatchery origin (Table 1). All Chinook carcasses encountered during each survey, which were not previously counted (as indicated by a cut tail), were identified by sex and external marks (i.e. fin clips, tags, etc.), and most were scanned for coded wire tags. Only one coded wire tag was found from scanning 569 carcasses. Note that WDFW began Chinook surveys the latter part of September, which over lapped with this survey effort. Therefore, total carcass counts for the survey period summarized in this document are biased low (Table 1). WDFW Chinook carcass counts by reach should be added to those in Table 1 for surveys that WDFW conducted prior to October 12, 2015 (the day of the last survey we conducted).

Coho
Carcass and redd counts were much lower in 2015 than during the prior two seasons (over 20 times lower). A total of two coho redds were counted within North Fork Lewis River tributary survey reaches during the 2015 season (five tributaries encompassing 4.8 survey miles total). A total of five coho carcasses were observed; four hatchery female and one unmarked male (Table 1). No carcasses contained coded wire tags. All females were spawned out. Of note is that until heavy rains started in November, stream flow in all tributary reaches was very low and may have hindered upstream migration of coho into the tributaries.

A total of 12 coho carcasses were observed in the entire mainstem North Fork Lewis River survey area over 18 survey days; eight hatchery female, two hatchery male, and two unmarked male. All were observed in reaches 4 and 5. Two carcasses contained coded wire tags. Ninety percent of female carcasses observed were pre-spawn mortalities. About 83 percent of carcass were of hatchery origin. All 12 coho carcasses observed were marked and

released to complete the mark-resight estimate of total carcasses. Only two carcasses were resighted.

Discussion

Flows were substantially lower during the 2015 spring Chinook survey season, but substantially higher during the coho survey season compared to the prior two seasons. During the spring Chinook survey period average daily flow was 850 cfs, but was 1,296 and 3,376 cfs in 2014 and 2013 (respectively). During the coho survey period average daily flow in was 8,429 cfs, but was 7,876 and 4,804 cfs in 2014 and 2013 (respectively). Low flows likely increased detection probability for spring Chinook carcasses and redds in 2015 compared to previous years. However, high flows likely reduced carcass and redd detection probability for coho due to reduced visibility caused by increased depth and turbidity, and increased carcass transport rate downstream due to higher velocities. High flows and associated turbidity precluded coho surveys for nearly the entire month of December. A substantial proportion of all carcasses recovered in the prior two survey years were collected in December; 25% in 2014 and 60% in 2013.

Coho redd surveys of the mainstem North Fork Lewis River were ineffective at differentiating coho vs. fall Chinook redds due to the very large number of fall Chinook spawning in the North Fork Lewis River compared to coho. Peak counts of live coho spawners and holders were hindered by poor visibility due to high flows and associated turbidity.

As in prior years, PacifiCorp conducted river drawdowns on Wednesdays during the coho and fall Chinook spawning survey season (as possible) at the request of WDFW to improve WDFW's ability to recover fall Chinook carcasses. As in prior years, Meridian specifically avoided conducting coho surveys on Wednesday drawdowns (3 drawdowns total this season) at the request of WDFW. Prior data analysis suggests that coho carcass recovery rates may be improved during lower flows. Avoiding coho surveys on Wednesday drawdowns also likely resulted in fewer coho carcass recoveries.

Due to the overall very low number of coho carcasses observed for the mark-resight method (12 carcasses marked and 2 resighted), statistical estimates of total carcasses were not generated as results would likely be spurious due to low sample size. In comparison, 41 of 328 marked coho carcasses were resighted in 2013 and 18 of 431 marked carcasses were resighted in 2014. The same survey crew conducted all surveys during all three years covering the same reaches and season. This suggests that poor survey conditions due to high flows, as well as overall lower coho returns to the Lewis River basin accounted for the lack of coho observations during the 2015 survey season.

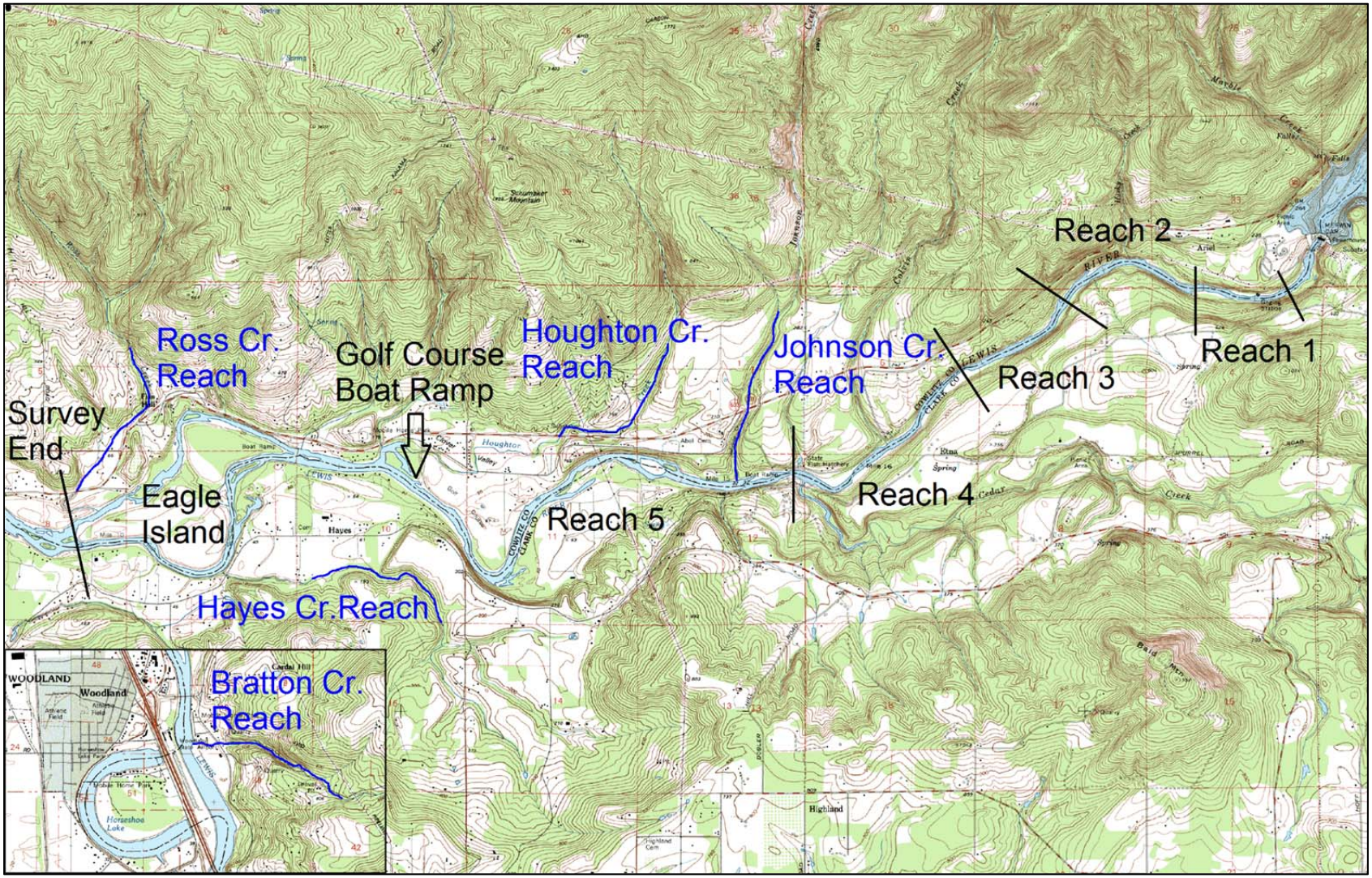

Figure 1. 2015 North Fork Lewis River and tributaries downstream of Merwin Dam spawning survey reach map.

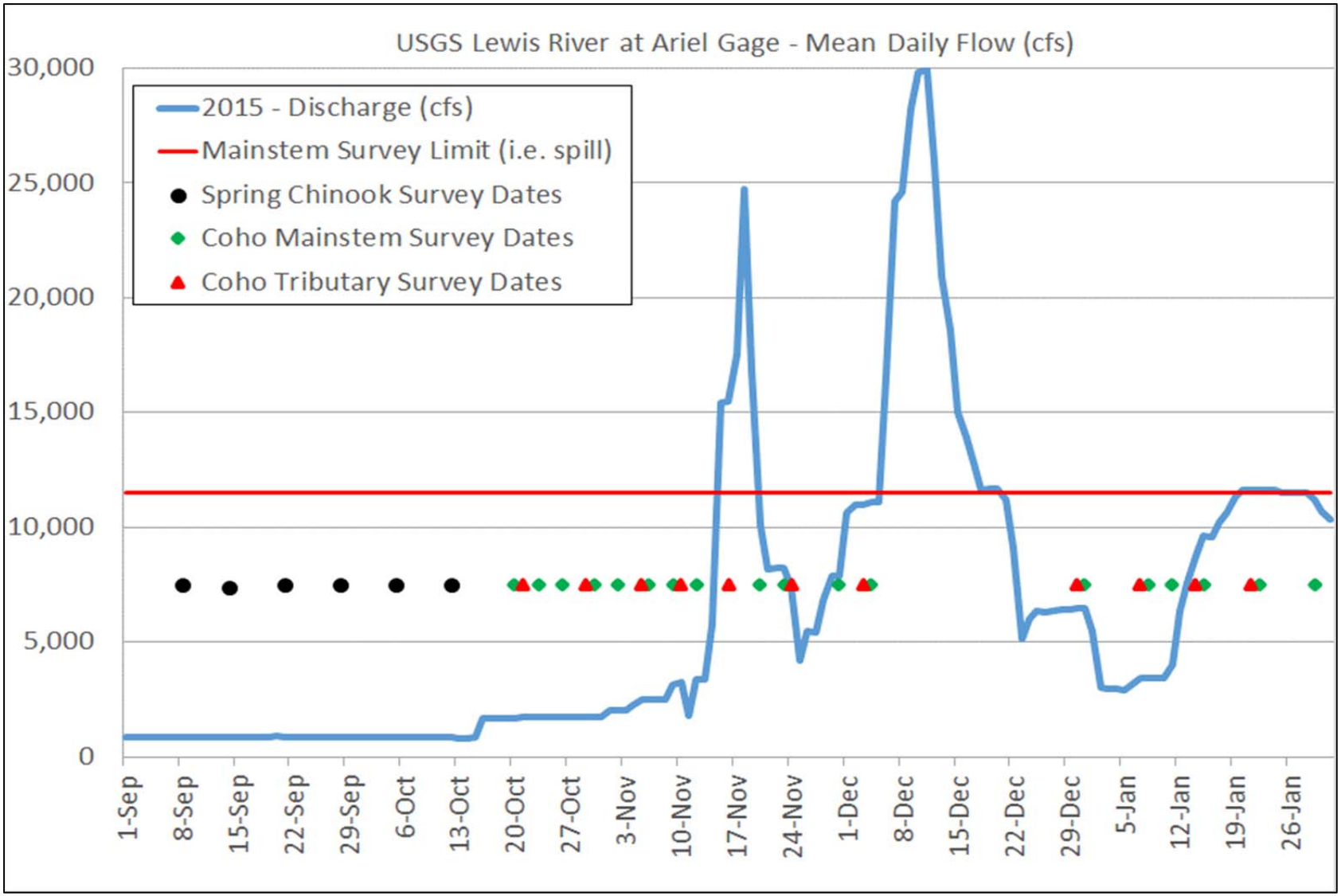

Figure 2. USGS Lewis River at Ariel gage – mean daily flow (cfs).

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Table 1. Summary of spring Chinook and coho salmon spawning surveys downstream of Merwin Dam (September 2015 through January 2016).

Stream	Reach Length (miles)	Total Weeks	Weeks Surveyable	New Redds	Live Holders	Live Spawners	Hatchery Male Carcass	Hatchery Female Carcass	Unmarked Male Carcass	Unmarked Female Carcass	Total Carcass	Carcass Tagged	Carcass Tags Recovered	Pre-spawn Mortality (Females)	Carcass Wanded for CWT	CWT Positive Carcass
September 2015 through mid-October 2015 Spring Chinook Salmon Summary																
NF Lewis R. Reach 1	0.57	6	6	2	17	8	19	17	3	1	40	?[5]	0[a]	50%	31	0
NF Lewis R. Reach 2	0.68	6	6	409	5	1205	147	99	18	23	287	?[5]	5[a]	3%	197	1
NF Lewis R. Reach 3	0.97	6	6	503	5	1297	126	85	13	23	247	?[5]	2[a]	2%	179	0
NF Lewis R. Reach 4	1.32	6	6	443	232	982	68	51	12	10	141	?[5]	1[a]	0%	107	0
[1]NF Lewis R. Reach 5	2.91	6	6	128	38	198	22	27	12	16	77	?[5]	0[a]	20%	55	0
NF Lewis R. total	6.45	6	6	1485	297	3690	382	279	58	73	792	?[5]	8[a]	5%	569	1
mid-October 2015 through January 2016 Coho Salmon Summary																
NF Lewis R. Reach 1	0.57	15	12	NA[2]	NA[3]	NA[3]	0	0	0	0	0	0	0	NA	0	NA
NF Lewis R. Reach 2	0.68	15	12	NA[2]	NA[3]	NA[3]	0	0	0	0	0	0	0	NA	0	NA
NF Lewis R. Reach 3	0.97	15	12	NA[2]	NA[3]	NA[3]	0	0	0	0	0	0	0	NA	0	NA
NF Lewis R. Reach 4	1.32	15	12	NA[2]	NA[3]	NA[3]	1	0	0	1	2	2	1	0%	2	0
NF Lewis R. Reach 5	7.30	15	12	NA[2]	NA[3]	NA[3]	1	8	0	1	10	10	1	100%	10	2
NF Lewis R. total	10.84	15	12	NA[2]	NA[3]	NA[3]	2	8	0	2	12	12	2	90%	12	2
Bratton Creek	1.0	15	10	0	0	0	0	1	0	0	1	NA[6]	NA[6]	0%	1	0
Hayes Creek	1.0	15	11	0	0	0	0	0	1	0	1	NA[6]	NA[6]	NA	1	0
Houghton Creek	1.0	15	10	0	0	0	0	0	0	0	0	NA[6]	NA[6]	NA	0	NA
[4]Johnson Creek	1.00	15	10	0	0	2	0	0	0	0	0	NA[6]	NA[6]	NA	0	NA
Ross Creek	0.95	15	10	2	0	10	0	3	0	0	3	NA[6]	NA[6]	0%	3	0
Tributaries Total	4.95	15	10	2	0	12	0	4	1	0	5	NA[6]	NA[6]	0%	5	0

[1]All Reach 5 surveys ended at the Golf Course ramp due to low water conditions.

[2]Redd surveys in the mainstem NF Lewis R were ineffective at differentiating coho vs. fall Chinook redds due to the large number of fall Chinook spawning compared to coho.

[3]Peak counts of live spawners and holders were hindered by poor visibility due to high flows and associated turbidity, and the large number of fall Chinook present.

[4]Total Johnson Creek survey reach length is 1.0 miles, but about 0.15 miles within the 1.0 mile reach was not surveyed due to denial of access by the landowner.

[5]WDFW conducted carcass tagging and the total carcass tags deployed overlapping with this survey effort is unknown.

[6]Carcass tagging is not part of the tributary coho survey methodology.

[a]WDFW carcass tags recovered.

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Tel 206 522-8282 Fax 206 522-8277 www.meridianenv.com

APPENDIX H - Lewis River Fall Chinook Escapement Report 2014-2015

Results of Sampling the North Fork Lewis River Natural Spawning Fall Chinook in 2014-2015

Columbia River Progress Report 2015-3

Washington Department of Fish and Wildlife
Fish Program-Southwest Region 5
2108 Grand Boulevard
Vancouver, Washington 98661

Shane Hawkins
April 2015

Introduction

Since 1964, fall Chinook spawning surveys have occurred annually on the Lewis River. Yearly population estimates were derived from these surveys. The annual escapement estimates are used to reconstruct the Lower River Wild (LRW) stock component, of the Columbia River fall Chinook returns. The compiled database is then used in conjunction with harvest estimates to estimate harvest rates relative to Pacific Salmon Treaty and ESA commitments. The LRW stock was listed as threatened under the Endangered Species Act, in March 1999. In addition, the escapement database has been combined with the Lewis River Wild Stock Tagging Project (Hawkins 1998a) to monitor river flows and juvenile fall Chinook production.

Age and stock composition of the annual Lewis River fall Chinook natural spawn have been estimated since 1981. Fish scales are used for aging and coded wire tags (CWT) for stock analysis, and documented by Grimes (1994), Hawkins (1993; 1996a; 1996b; 1996c; 1998; 2013a-i), Hawkins and Roler (1991), Kreitman (1981a; 1981b), Norman (1982; 1983; 1985a; 1985b; 1986; 1987; 1988), and Roler (1990a; 1990b; 1993). As part of compiling this annual escapement estimate, a carcasses mark recapture study was also completed. This report summarizes the data collected from spawning surveys in the fall and early winters of 2013-14 and does not address the carcass tagging study other than to report the additional effort involved. The escapement estimate in this report was based on recent year's methodology.

Methods

North Fork Lewis River

The 2014 fall Chinook sampling included grading by decomposition condition of the carcasses and the attachment of two-numbered plastic operculum tags one for each operculum. Six weekly live, red and dead counts were made on Tuesdays and the data recorded by section (Section 1-5). Three counts were conducted in October and three in late November and early December. For each three count group GPS points of redds were taken. Age and escapement estimates were based on weekly carcasses recoveries from both Tuesday and Wednesday. Besides incorporating two carcass recovery days and a one 1 in 5 sample rate during four peak recovery weeks all other methods were the same as developed in 2003 (Hawkins, 2012) based on carcasses tagging results from 2000-2002 (Hawkins, 2012). Weekly flow reductions, discharge rate of 2,000 cfs at Merwin Dam were requested from PacifiCorp to begin in October to assist in carcass recoveries. Additional reductions, to a discharge rate of 1,200 cfs, were requested for November to further assist in carcass recovery. Additional reductions of flows by ~2,000 cfs were requested to assist carcass recoveries in December and early January. Carcass recoveries were first judged on the ability to sample for CWTs and the possibility to recover an operculum tag. Operculum tagged carcasses were considered recoveries and as such previously sampled. Non-operculum tagged carcasses were consider a new carcass and examined for fin clips and possible coded wire tag (CWT) recovery. New carcasses were graded 2, 3 and 4s being of condition fresh enough to be operculum tagged. Carcasses not meeting these grades where then CWT sampled and enumerated as adipose present or absent. Those older carcasses along with those already operculum tagged were deformed buy chopping the carcasses into two pieces. Chopped carcasses were tallied and operculum tags recorded by section. Data was collected from all operculum numbered tagged carcasses. The tag numbers were recorded along with carcass

condition, length, sex and adipose fin disposition and three scales taken. Cumulative weekly counts of carcasses by section (1-5) were recorded by presence or absence of fin clips.

Surveys were spread over 17 weeks and included 44 boat trips ranging from one boat trip per week in September and October and again in late January to 6 boat trips per week during the late November counts.

The nose (snout) area was examined electronically with a 'wand' for presence of a CWT from all adipose fin-clipped salmon. The snout was removed from all wand positive carcasses for the CWT recovery. A number label with the recorded date, sex, fork length and species was attached to the snouts recovered. Not all scales taken were used for age analysis for this report. Age analysis used only the fresh (condition 2) carcasses (bright clear eyes) those thought to have spawned since the last survey, the criteria used in recent years. Three scales were placed by operculum tag numbered position on a scale card along with this recorded information; sex, fork length, fin-clips, and CWT label number where pertinent. The sex and fork length, fin-clips and CWT label number were also recorded on a scale card slot for all CWT snouts taken with no accompanying scales, (older carcasses). Ages read from the scales were used to determine the age composition of the weekly natural spawn. The ages read from fresh carcasses were expanded for a 1 in 5 and a 1 in 10 sample rates incorporated during the peak carcass recovery weeks. The 1 in 5 was used for the weeks of (November 12- November 19 and December 10- December 17). The 1in 10 was incorporated for weeks (November 26 and December 3). These expansions assume a random sample and no recovery age bias, as assumed for the older carcasses recovered. The ages read from the less than fresh carcasses (condition 3 and 4) we ignored for this report and treated the same as carcasses not directly aged.

The ages, of all carcasses not directly aged were estimated (age assigned). The estimation began by first assigning non aged carcasses to a spawn week. The assignment was accomplished by moving the older carcasses sampled into preceding weeks spawn. The movement was based on weekly tagged carcasses recovered in subsequent weeks, percentage of the combined weeks tags recovered the first, second, third and fourth weeks out. Carcass life ranged from two weeks after being tagged in October to six weeks in December and January (Hawkins, 2012).

Once assigned to a spawn week, the age composition derived from that week's scale sample was applied with some adjustment. The adjustment applied was the sum of age bias for all carcass tags recovered. The bias is the difference in recovery rates; 0.13 for 2 year-olds, 0.30 for 3 year-olds, 0.32 for 4 year-olds, 0.39 for 5 year-olds, and 0.54 for 6 year-olds (Hawkins, 2012). The expected age and sample size was proportioned to equal the actual carcasses assigned. The CWTs recovered with assigned carcasses were also assigned a spawn week. The assignment of the CWTs was a little more subjective (single fish versus a percent assigned to a week). While the percentage of tags went with the percentage of carcasses which individual tag went where was arbitrary with some subjectivity utilizing carcass condition.

CWTs were used to determine Lewis River wild stock composition. Spawn weeks with only and large number of Lewis River wild (LW) CWTs recoveries were used to generate LW tag rates. These LW rates were then applied to the few LW CWTs recovered in other spawn weeks to account for all the LW carcasses examined. The Lower Columbia River hatchery (LRH)

contribution to the natural spawn was determined from wand negative adipose clip fish and those adipose fin clipped carcasses with LRH tags. The few adipose wand negative carcasses attributed to the natural spawn after the second week of November (Wk 2) were considered tag loss from LW-CWT. Carcasses with no adipose clips recovered from the spawn prior to November (Wk 2) were considered be Lower Columbia River stock same as LRH but not of hatchery origin and not accounted for by expanded LW-CWTs. Carcasses examined but not accounted for by CWTs in late December through early February were considered non-tagged LW stock (non-CWT).

Carcass examination rates; .0229 for 2 year-olds, 0.5037 for 3 year-olds, 0.5837 for 4 year-olds, 0.7083 for 5 year-olds, and 0.8263 for 6 year-olds developed from mark recapture studies (Hawkins, 2012) were applied to carcasses examined for all stocks to estimate escapement.

Cedar Creek

Cedar Creek LRH and LCR fall Chinook escapement was combined with the Lewis River LRH and LCR estimates, for a combined North Lewis River basin LRH and LCR stock estimate. The Cedar Creek estimate was obtained from two separate estimates: above and below the fish-way ladder trap at river mile 2.6. The first estimate was obtained using carcass mark recapture methods and weekly foot surveys in the lower 2.5 miles of the creek. The escapement estimate for the upper reaches of Cedar Creek was based on live mark recapture methods. Live fish were captured at a fish-way ladder (RM 2.6) with a trap installed just prior to its exit. Upon capture the live/dead fish were sampled using the same protocols as carcasses sampled. Live fish identified to have a CWT were sacrificed for tag recovery. All other live fish counted were marked with a uniquely numbered visual tag and released just upstream of exit. Not all fish use the fish-way and not all the fish using the fish-way spawn above the fish-way. Those fish spawning below with visual tags were considered as part of the lower spawn. The visual tags/fish were expanded by the lower section carcass recovery rates to account for all visual tags in the lower sections spawn. Expanded fall backs were subtracted from fish-way counted fish put upstream.

To account for and sample those fish not using the fish-way foot surveys in portions of upper Cedar Creek were preformed weekly to examine carcasses for visual tags. A weir and trap (RM 6.1) were used to increase the number of Chinook examined for visual tags above the fish-way. All newly observed fish/carcasses were aged and CWT sampled. The numbers of fish/carcasses observed above the fish-way with or without visual tags was used to estimate trap efficiency. This efficiency was used to expand the tagged fish upstream for upper Cedar Creek escapement.

Results

During seventeen weekly surveys, beginning on September 26, 2014 and ending on January 13, 2015, a total of 14,752 fall Chinook carcasses were examined for the recovery of 142 snouts taken for CWTs (Table 1). Scales samples were taken from 2,893 carcasses of which all but seven were also carcass tagged. Forty percent of those carcasses tagged, 1,156 were later recovered. Based on carcass condition (2), only 1,806 of the scale sampled carcasses were actually used in this report for age analysis. Age was determined from 97% of the scale samples collected. The age samples used in report represented 12.2% of all the fall Chinook carcasses examined (Table 2). The scale analysis provided an age composition for each spawn week. The

summary age composition of the natural spawn was comprised of 5.1% age 2s, 7.7% age 3s, 76.3% age 4s, 7.3% age 5s, and 0.1% age 6s. In addition to the 151 scales taken but were not able to be read an additional 3,368 carcasses were assumed to be part of the spawn week as sampled base on 1 in 5 random sample applied over 2- 2 week periods (November 12- November 19 and December 10- December 17) and 2 weeks sampled at 1 in 10 weeks November 26- December 3.

The remaining 9,578 carcasses sampled and the associated CWTs were assumed to have been part of a previous spawn weeks and were assigned to a spawn week. Once the carcasses were assigned a spawn week ages were estimated (age assigned). The assignment was based on an expected age composition derived from age specific carcass tag recovery rates applied to the ages read (age actual from scales) from the fresh carcasses recovered during that spawn week. Table 3 combines the age assigned carcasses with the age actual carcasses for age totals sampled for each spawn week. The age summary for all the carcasses examined was estimated to be comprised of 460 age 2s, 1,113 age 3s, 11,899 age 4s, 1,263 age 5s and 16 age 6s.

A total of 113 fall Chinook CWTs were read from 124 snouts taken. They included 28 assorted out of basin hatchery origin strays and 85 wild Lewis River (LW-CWT) tags (Table 4). Through the assignment of a spawn week for all CWTs read, based on the subjectivity of carcass condition, stock separation was possible with only some overlap (Table 5). Using the period when 87.1% of the LW-CWTs were recovered tag rates were generated for those CWTs (Table 6). The CWT tag rates generated were 0.003 for 2012 brood, 0.003 for 2011 brood, 0.0075 for 2010 brood, 0.013 for 2009 brood, and 0.0 for 2008 brood. The rates were then used to estimate the LW-CWT contribution to both the earlier spawn and later spawning. The remaining early spawn was further separated by hatchery stray contribution. Adipose fin clips identified 1,086 of the carcasses sampled as hatchery in origin (LRH; Table 7). The CWTs recovered with these clipped (LRH) hatchery carcasses were 22 from Kalama, 1 from Washougal,1 from Big Creek, and 2 from Cowlitz hatcheries. Other stray CWTs were 1 Quinault origin and 1 URB origin above Bonneville Dam. The 10 LW-CWTs and clips were the only ad-clipped carcasses not counted as hatchery origin. All the non-clipped carcasses (2,354) sampled during early spawning were considered to be of wild Lewis River origin. The 10 Lewis River wild CWTs recovered in the early spawn period expanded by the generated tag rates assigned 1,287 of the non-clipped carcasses examined to the LW-CWT escapement. The remaining 1,067 carcasses examined in both October and early November were considered to be of wild LRH type. These same tag rates were then applied to the 1 tag recovered from the late December spawn. All the LW-CWTs recovered estimated the total LW carcasses examined at 11,442.

The one late LW- CWT recovered from the late December and January spawn expanded to account for 80 of the 1,237 carcasses examined from this late spawn (Table 8). The remaining 1,157 carcasses were then considered late Lewis River wild stock not represented by CWTs (LW-non-cwt).

The combined Lewis River fall Chinook escapement was then estimated by brood specific expansion rates. The expansion rates were applied by brood and sex, to the carcasses examined. The total 2014 North Fork Lewis River fall Chinook escapement was estimated to have totaled 26,410 (Table 9). Of which14,682 were estimated to have been females. The by brood break

down of the fall Chinook escapement in the Lewis River was; 2,010 2-yr-olds, 2,210 3-yr-olds, 20,387 4-yr-olds, 1,784 5-yr-olds, and 19 6-yr-olds. The wild contribution to the total escapement was estimated to be 24,510 or 92.8%. Sample rate expanded CWTs (145) estimated an escapement of 20,507 LW-CWT wild fall Chinook or 83.7% of the Chinook escapement.

The remaining escapement included 1,986 late spawning wild fall Chinook and 2,017 early spawning wild fall Chinook. The 1,901 stray hatchery Chinook accounted for 7.2 percent of the total escapement.

The early components of the Lewis River escapement both hatchery and wild were combined with the total Cedar Creek escapements to provide a total Lewis River North Fork basin LRH escapement. The combined basin LRH type fall Chinook escapement totaled 5,619 (Table 10). Based on adipose fin clipped count the combined hatchery contribution to the escapement was 2,811. Since all hatchery fall Chinook in the Lewis River basin are out of basin strays, the accompanying CWTs were considered as one spawn whether it occurred in the Lewis River or Cedar Creek. The combined hatchery CWTs recovered expanded to 52. The wild component of the LRH escapement was estimated at 2,807.

Discussion

Carcass sampling in 2015 turned out to be the largest ever with just under 15,000 carcasses examined for CWTs. Surveys proceeded weekly beginning in late September through mid-January with no interruption. In late January higher flows ended surveys even though a few carcasses probably would have been recovered. A peak count on November 26 under good conditions provided a count of 5,196. Removing the 107 chopped carcasses a count of 5,089 would be consistent protocol with used for the 5.28 expansion or an estimate of 26,870. The carcass expansion derived in this report estimated the escapement of 26,410 a difference of 1.7%.

Table 1. Lewis River 2014 spawning survey effort and conditions.

	Weekly survey data				Boat	CFS Discharge at Merwin	
Dates	Sampled	Aged	CWTs	CWT/Rate	Crews	Surveyed	Previous Max
26-Sep	7	7	2	0.2857	1	1,200	1,200
3-Oct	93	33	2	0.0215	1	1,200	1,200
8-Oct	169	125	3	0.0178	1	1,200	1,200
15-Oct	414	203	8	0.0193	1	1,200	1,200
22-Oct	607	103	10	0.0165	2	5,000	1,200
29-Oct	361	196	3	0.0083	2	2,580	2,580
5-Nov	643	311	9	0.0140	2	1,200	4,200
12-Nov	1,443	244	9	0.0062	3	10,000	10,000
19-Nov	2,692	523	21	0.0000	5	1,500	4,200
26-Nov	2,841	299	19	0.0067	5	1,200	6,800
3-Dec	1,472	107	6	0.0041	5	8,000	16,400
10-Dec	1,369	198	14	0.0102	4	11,400	11,400
17-Dec	1,605	151	15	0.0093	4	4,300	6,800
23-Dec	424	191	2	0.0047	2	11,000	11,200
30-Dec	431	132	0	0.0000	2	5,200	10,000
7-Jan	86	36	1	0.0116	2	11,600	9,000
13-Jan	95	34	0	0.0000	2	6,600	11,600
Totals							
17	14,752	2,893	124	0.0084	44		

Table 2. Lewis River 2014 fall Chinook weekly brood composition of the natural spawn. Age determined from scales taken from fresh carcasses.

	Weekly brood contribution in percent							
Date	2012 2s	2011 3s	2010 4s	2009 5s	2008 6s	Aged Used	*	Sampled	Percent Aged
26-Sep	0.0%	0.0%	100.0%	0.0%	0.0%	7		76	9.2%
3-Oct	0.0%	6.1%	81.8%	6.1%	0.0%	33		110	29.9%
8-Oct	0.8%	12.1%	55.8%	3.4%	0.0%	125		402	31.1%
15-Oct	2.5%	10.1%	70.6%	6.0%	0.0%	203		713	28.5%
22-Oct	7.7%	21.8%	104.9%	22.5%	0.0%	65		382	17.0%
29-Oct	6.3%	2.9%	67.3%	9.3%	0.0%	112		660	17.0%
5-Nov	4.4%	8.7%	76.9%	3.6%	0.0%	203		1,097	18.5%
12-Nov	4.1%	5.3%	84.3%	5.7%	0.0%	190	*	2,454	7.7%
19-Nov	8.5%	13.5%	76.3%	4.8%	0.0%	271	*	2,739	9.9%
26-Nov	8.0%	9.3%	75.5%	7.4%	0.0%	172	*	1,913	9.0%
3-Dec	3.5%	1.0%	70.9%	3.4%	0.0%	79	*	1,507	5.2%
10-Dec	1.7%	3.4%	83.3%	16.0%	0.0%	105	*	1,463	7.2%
17-Dec	1.5%	7.9%	69.2%	7.7%	1.6%	73	*	651	11.2%
23-Dec	1.2%	2.5%	84.2%	11.0%	0.0%	86		353	24.4%
30-Dec	0.0%	0.0%	73.7%	26.3%	0.0%	82		148	55.4%
7-Jan	0.0%	0.0%	57.9%	42.1%	0.0%	14		69	20.4%
13-Jan	0.0%	0.0%	29.4%	29.4%	0.0%	17		17	100.0%
2013	5.1%	7.7%	76.3%	7.3%	0.1%	1,806		14,752	12.2%

* Scales were taken from relatively fresh carcasses and graded by condition for a Carcass Tagging Study. Only carcasses graded to have spawen within previous seven days were used for this report. These selected scales were then aged and used to calculate the age composition of the weekly natural spawn. Do to the large return and the scope of the tagging study a radon sub-sample collection of scales was necessary for several weeks surveyed. Scale samples used from these weeks were expanded by the sub-sample rates.

Table 3. The 2014 age composition for all Lewis River fall Chinook carcasses examined.

Spawn Week	Sampled	Time Adjusted CWTs	Rate	The summation of age actual and expected contribution towards the carcasses examined for CWTs 2012	2011	2010	2009	2008
Sept Wk 3	0			0.0%	0.0%	0.0%	0.0%	0.0%
Sept Wk 4	76	1	0.013	0.0%	0.0%	100.0%	0.0%	0.0%
Oct Wk 1	110	2	0.018	0.0%	15.4%	82.8%	1.8%	0.0%
Oct Wk 2	402	2	0.005	0.6%	16.1%	77.9%	5.4%	0.0%
Oct Wk 3	713	14	0.020	1.6%	10.9%	79.8%	7.8%	0.0%
Oct Wk 4	382	8	0.021	2.7%	13.3%	67.3%	16.7%	0.0%
Oct Wk 5	660	1	0.002	3.7%	3.2%	80.1%	13.0%	0.0%
Nov Wk 1	1,097	10	0.009	2.5%	9.0%	84.0%	4.6%	0.0%
Nov Wk 2	2,454	13	0.005	2.5%	5.1%	85.7%	6.6%	0.0%
Nov Wk 3	2,739	21	0.008	5.4%	12.9%	76.2%	5.4%	0.0%
Nov Wk 4	1,913	5	0.003	5.7%	9.2%	76.8%	8.3%	0.0%
Dec Wk 1	1,507	22	0.015	2.8%	1.2%	91.1%	4.9%	0.0%
Dec Wk 2	1,463	12	0.008	1.0%	3.1%	78.8%	17.2%	0.0%
Dec Wk 3	651	1	0.002	1.2%	8.6%	78.3%	9.6%	2.4%
Dec Wk 4	353		0.000	0.6%	2.3%	84.3%	12.7%	0.0%
Dec Wk 5	148		0.000	0.0%	0.0%	72.0%	28.0%	0.0%
Jan Wk 1	69	1	0.015	0.0%	0.0%	54.3%	45.7%	0.0%
Jan Wk 3	17		0.000	0.0%	0.0%	50.0%	50.0%	0.0%
Jan Wk4	0		0.000	0.0%	0.0%	0.0%	0.0%	0.0%
Jan Wk 4	0		0.000	0.0%	0.0%	0.0%	0.0%	0.0%
2014 Examined	14,752	113	0.008	460	1,113	11,899	1,263	16

The age expected was derived from assigning a spawn week for the old carcasses examined. Then using the week's age actual adjusted by carcass recovery rates derived from, the 2001 and 2002 Lewis River carcass tagging results, age specific recovery rates.

Table 4. Coded wire tags read from Lewis River fall Chinook spawning surveys in 2014.

Lewis River Wild Origin				Hatchery Origin				
Recoveries	**Code**	**Origin**	**Brood**	**Recoveries**		**Code**	**Origin**	**Brood**
Lewis				Cedar Cr	Lewis			
12	**63-51-85**	**Lewis**	**09**			63-51-94	Kalama	09
24	**63-51-86**	**Lewis**	**10**		3	63-51-96	Kalama	09
11	**63-55-80**	**Lewis**	**10**		1	05-51-68	Quinault	09
34	**63-58-97**	**Lewis**	**10**	1	2	63-56-94	Cowlitz	10
1	Lost Tag	**Lewis**	**10**	2	10	63-55-94	Kalama	10
2	**63-61-90**	**Lewis**	**11**		1	63-55-95	Kalama	10
1	**63-64-65**	**Lewis**	**12**		6	63-55-97	Kalama	10
					1	22-02-08	URB	10
					1	63-61-99	Kalama	11
85								
					1	63-62-64	Kalama	11
					1	63-61-95	Washougal	11
					1	09-05-66	Big Cr.	11
				3	28			

Table 5. Sampled carcasses and coded wire tags (CWT) adjusted to an assigned to a spawn week, in 2014.

			Sampled carcasses contributing towards the CWTs recovered, by brood						
Spawn Timing	**CWT Rate**	**Stock**	**2s 2012**	**3s 2011**	**4s 2010**	**5s 2009**	**6s 2008**	**Total**	**Percent Sampled**
Sept Wk 3	0.0000	Spr-LRH	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0%**
Sept Wk 4	0.0000	Spr-LRH	**0.0**	**0.0**	**75.8**	**0.0**	**0.0**	**75.8**	**0.5%**
Oct Wk 1	0.0132	LRH	**0.0**	**17.0**	**91.4**	**2.0**	**0.0**	**110.4**	**0.7%**
Oct Wk 2	0.0050	LRH	**2.5**	**64.6**	**313.3**	**21.8**	**0.0**	**402.2**	**2.7%**
Oct Wk 3	0.0196	LRH	**11.1**	**77.4**	**568.7**	**55.5**	**0.0**	**712.8**	**4.8%**
Oct Wk 4	0.0209	LRH-LRHw	**10.4**	**51.0**	**257.0**	**63.7**	**0.0**	**382.1**	**2.6%**
Oct Wk 5	0.0015	LRH-LRHw	**24.2**	**21.2**	**528.5**	**86.1**	**0.0**	**660.0**	**4.5%**
Nov Wk 1	0.0091	LRW-CWT	**27.0**	**98.8**	**920.7**	**50.2**	**0.0**	**1,096.7**	**7.4%**
Nov Wk 2	0.0053	LRW-CWT	**61.6**	**125.6**	**2,104.1**	**162.8**	**0.0**	**2,454.0**	**16.6%**
Nov Wk 3	0.0077	LRW-CWT	**148.2**	**354.2**	**2,087.9**	**148.3**	**0.0**	**2,738.6**	**18.6%**
Nov Wk 4	0.0026	LRW-CWT	**109.9**	**175.3**	**1,468.8**	**159.1**	**0.0**	**1,913.0**	**13.0%**
Dec Wk 1	0.0146	LRW-CWT	**41.5**	**18.8**	**1,372.2**	**74.2**	**0.0**	**1,506.6**	**10.2%**
Dec Wk 2	0.0082	LRW-CWT	**14.2**	**45.0**	**1,152.3**	**251.5**	**0.0**	**1,463.1**	**9.9%**
Dec Wk 3	0.0015	CWT-noCWT	**7.6**	**56.1**	**509.1**	**62.2**	**15.6**	**650.6**	**4.4%**
Dec Wk 4	0.0000	Non-CWT	**2.3**	**8.3**	**297.3**	**44.7**	**0.0**	**352.5**	**2.4%**
Dec Wk 5	0.0000	Non-CWT	**0.0**	**0.0**	**106.6**	**41.4**	**0.0**	**148.0**	**1.0%**
Jan Wk 1	0.0077	Non-CWT	**0.0**	**0.0**	**37.3**	**31.3**	**0.0**	**68.6**	**0.5%**
Jan Wk 3	0.0000	Non-CWT	**0.0**	**0.0**	**8.5**	**8.5**	**0.0**	**17.0**	**0.1%**
Jan Wk 4	0.0000	Non-CWT	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0%**
2014 Examined			**460**	**1,113**	**11,899**	**1,263**	**16**	**14,752**	

The percentages represent the expected age composition of all the carcasses examined from any one weeks spawn. The age expected was derived from assigning a spawn week to old carcasses examined in following week. The assignment was based on the actual age composition of a week's natural spawn and an expected recovery of other carcasses examined in following weeks from that weeks specific spawn. Expected recovery rates were derived from the 2001 and 2002 Lewis River Mark Recapture Study using fresh tagged carcasses and their age specific recovery rates.

Table 6. Lewis River fall Chinook coded wire tag (CWT) rate by brood in 2014.

	CWT sampled by brood						
Spawn	2s	3s	4s	5s	6s		
Timing	**2012**	**2011**	**2010**	**2009**	**2008**	**Total**	**Percent**
Nov Wk1					**0.0**	**0**	**0.0%**
Nov Wk 2	**61.6**	**125.6**	**2,104.1**	**162.8**	**0.0**	**2,454.0**	**16.6%**
Nov Wk 3	**148.2**	**354.2**	**2,087.9**	**148.3**	**0.0**	**2,739**	**18.6%**
Nov Wk 4	**109.9**	**175.3**	**1,468.8**	**159.1**	**0.0**	**1,913**	**13.0%**
Dec Wk 1	**41.5**	**18.8**	**1,372.2**	**74.2**	**0.0**	**1,507**	**10.2%**
Dec Wk 2	**14.2**	**45.0**	**1,152.3**	**251.5**	**0.0**	**1,463**	**9.9%**
Dec Wk 3							
Sum	**375**	**719**	**8,185**	**796**	**0**	**8,612**	**58.4%**
CWTs	1	2	61	10	0	74	87.1%
Rate	**0.0027**	**0.0028**	**0.0075**	**0.013**	**0.0000**	**0.0086**	
October Lewis CWT Wild contribution to carcasses sampled							
CWTs	0	0	9	1	0	10	
Sampled	0	0	1,208	80	0	1,287	**8.7%**
Late December Lewis CWT Wild contribution to carcasses sampled							
CWTs	0	0	0	1	0	1	
Sampled	0	0	0	80	0	80	**0.5%**
Total CWT Lewis R. wild carcasses sampled (Oct-Dec)							
CWTs	1	2	70	12	0	85	
MS	**375**	**719**	**9,393**	**955**	**0**	**11,442**	**77.6%**

Table 7. Lewis River 2014 Hatchery Fall Chinook Stock Sampled by Brood

	CWT sampled by brood					
Spawn	2s	3s	4s	5s	6s	**Sampled**
Timing	**2012**	**2011**	**2010**	**2009**	**2008**	**Total**
Sept Wk 4	**0.0**	**0.0**	**75.8**	**0.0**	**0.0**	**76**
Ad-only	**0.0**	**0.0**	**22.2**	**1.0**	**0.0**	**23**
Oct Wk 1	**0.0**	**17.0**	**91.4**	**2.0**	**0.0**	**110**
Ad-only	**0.0**	**42.8**	**113.2**	**1.0**	**0.0**	**157**
Oct Wk 2	**2.5**	**64.6**	**313.3**	**21.8**	**0.0**	**402**
Ad-only	**2.1**	**42.2**	**234.2**	**17.5**	**0.0**	**296**
Oct Wk 3	**11.1**	**77.4**	**568.7**	**55.5**	**0.0**	**713**
Ad-only	**3.9**	**52.4**	**346.0**	**38.6**	**0.0**	**441**
Oct Wk 4	**10.4**	**51.0**	**257.0**	**63.7**	**0.0**	**382**
Ad-only	**2.1**	**10.6**	**83.8**	**10.2**	**0.0**	**107**
Oct Wk 5	**24.2**	**21.2**	**528.5**	**86.1**	**0.0**	**660**
Ad-only	**0.0**	**0.0**	**42.8**	**4.5**	**0.0**	**47**
Nov Wk 1	**27.0**	**98.8**	**920.7**	**50.2**	**0.0**	**1,097**
Ad-only	**0.0**	**0.0**	**15.1**	**0.0**		**15**
SUM	**75**	**330**	**2,755**	**279**	**0**	**3,440**
Sum AD-only (LRH)	**8**	**148**	**857**	**73**	**0**	**1,086**
LRHw &LRW	67	182	1,898	207	0	**2,354**
Sept.-October Lewis (LRW) CWT wild contribution to carcasses sampled						
CWTs	0	0	9	1	0	**10**
Sampled	0	0	1,208	80	0	**1,287**
Lower river hatchery stock (LRH)						
Sampled	**8**	**148**	**857**	**73**	**0**	**1,086**
Lower river hatchery stock (Wild)						
Sampled	**67**	**182**	**690**	**127**	**0**	**1,067**
Lower Columbia River hatchery coded wire tags (LRH-CWT) recovered.						
LRH-LRHw	**2012**	**2011**	**2010**	**2009**	**2008**	**Total**
CWTs Recovered						
LRH-Kalama	0	2	17	3	0	**22**
Quinault	0	0	0	1	0	**1**
Big Cr.	0	1	0	0	0	**1**
URB	0	0	1	0	0	**1**
LRH-Toutle	0	0	0	0	0	**0**
LRH-Washougal	0	1	0	0	0	**1**
Cowlitz	0	0	2	0	0	**2**
	0	4	20	4	0	28

Table 8. Lewis River Wild Fall Chinook(LRW) Non-CWT Group Sampled by Brood, 2014.

CWT sampled by brood

Spawn Timing	2s 2012	3s 2011	4s 2010	5s 2009	6s 2008	Sampled Total
Dec Wk 3	7.6	56.1	509.1	62.2	15.6	651
Dec Wk 4	2.3	8.3	297.3	44.7	0.0	353
Jan Wk 1	0.0	0.0	106.6	41.4	0.0	
Jan Wk 2	0.0	0.0	37.3	31.3	0.0	69
Jan Wk 3	0.0	0.0	8.5	8.5	0.0	17
SUM	10	64	959	188	16	1,237
Late December Lewis CWT Wild contribution to carcasses sampled						
CWTs	0.0	0.0	0.0	1.0	0.0	0.0
Sampled	0.0	0.0	0.0	79.6	0.0	80
Late December Lewis non-CWT Wild contribution to carcasses sampled 2014						
Sampled	10	64	959	109	16	1,157

Table 9. Lewis River 2014 Fall Chinook Escapement by Brood.

Escapement Derived from Brood Expansion by Carcass Recovery Rates.

	Expansion Rates						
	2s	3s	4s	5s	6s		
	2012	**2011**	**2010**	**2009**	**2008**	**Total**	**Percent**
Total Lewis River	**0.2290**	**0.5037**	**0.5837**	**0.7083**	**0.8263**		
Sampled	460	1,113	11,899	1,263	16	14,752	
Males	**460**	**871**	**4,431**	**282**	**0**	6,044	41.0%
Females		**242**	**7,468**	**982**	**16**	8,708	59.0%
Escapement	**2,010**	**2,210**	**20,387**	**1,784**	**19**	**26,410**	
Males	**2,010**	**1,729**	**7,592**	**398**	**0**	**11,729**	0
Females		**481**	**12,796**	**1,386**	**19**	**14,682**	1
Lewis River natural spawn split by hatchery and wild escapement.							
Hatchery (LRH) stray component by age determined from adipose clip							
Sampled	8	148	857	73	0	1,086	
Escapement	**35**	**294**	**1,469**	**103**	**0**	**1,901**	**7.2%**
Exp CWTs	0	8	34	6	0	47.9	
Lewis River wild fall chinook by age							
Sampled	452	965	11,042	1,191	16	13,666	
Escapement	**1,975**	**1,917**	**18,919**	**1,681**	**19**	**24,510**	**92.8%**
Lewis River wild natural spawn split by CWT recoveries.							
Lewis River CWT wild bright fall Chinook (LRB-CWT) by age							
Sampled	375	719	9,393	955	0	11,442	
Escapement	**1,639**	**1,427**	**16,093**	**1,348**	**0**	**20,507**	**83.7%**
Exp CWTs	4.37	3.97	119.93	16.94	0.00	145.21	
Early spawning Lewis River wild fall Chinook (LRHw) not represented by CWTs							
Sampled	67	182	690	127	0	1,067	
Escapement	**293**	**361**	**1,183**	**179**	**0**	**2,017**	**7.8%**
Late December spawning Lewis River wild fall Chinook (LRB-non-CWT) not represent by CWTs							
Sampled	10	64	959	109	16	1,158	
Escapement	**43**	**128**	**1,643**	**153**	**19**	**1,986**	**8.5%**

Escapement is base on carcass expansion rates generated from a three year mark recapture study, 2000-2002.

Table 10. Combined Lewis River and Cedar Creek lower Columbia River hatchery fall Chinook stock (LRH) carcasses examined and estimated escapement, in 2014.

Estimated lower Columbia River hatchery stock (LRH &LRHw) sampled in the Lewis River.

		2s	3s	4s	5s	6s	
Lewis River Expansion rates		**0.2290**	**0.5037**	**0.5837**	**0.7083**	**0.8263**	
Broods		**2012**	**2011**	**2010**	**2009**	**2008**	**Totals**
Ad-clip sampled Hatchery		8	148	857	73	0	1,086
Sampled (NMW) Wild		67	182	690	127	0	1,067
Escapement		293	361	1,183	179	0	2,017
Cedar Creek							
Sampled Above Trap		43	116	365	22	0	546
Ad-clipped	Hatchery	13	61	162	9	0	245
Non-clipped	Wild	30	55	203	13	0	301
Sampled Below Trap		5	25	172	14	0	216
Ad-clipped	Hatchery	2	18	114	8	0	142
Non-clipped	Wild	3	7	58	6	0	74
Total Sampled		48	141	537	36	0	762
Cedar Creek Fishway Trap Net Up							0
Upper Escapement							0
Ad-clipped	Hatchery	20	80	232	11	0	343
Non-clipped	Wild	47	86	346	16	0	495
Lower Escap	**0.3574**	**20**	**100**	**688**	**56**	**0**	**863**
Ad-clipped	Hatchery	8	72	456	32	0	568
Non-clipped	Wild	12	28	232	24	0	296
Total Cedar Creek Escapement		**87**	**266**	**1,266**	**83**	**0**	**1,701**
Ad-clipped	Hatchery	**28**	**152**	**688**	**43**	**0**	911
Non-clipped	Wild	**59**	**114**	**578**	**40**	**0**	791
North Lewis Basin Escapement		**415**	**921**	**3,917**	**365**	**0**	**5,619**
Ad-clipped	Hatchery	63	446	2,156	146	0	2,811
Non-clipped	Wild	352	475	1,761	219	0	2,807
Lower Columbia River hatchery CWTs expanded for escapement.							
LRH-Kalama		0	4	34	4	0	42
LRH-Cowlitz		0	0	6	0	0	6
LRH-Washougal		0	2	0	0	0	2
LRH-Big Creek		0	2	0	0	0	2
Sum expanded CWTs		0	8	40	4	0	52
Hatchery tag rates		0	0	0	0	0	0
Combined early returning Lewis River wild Chinook not represented by CWT (LRHw)							
LRHw Sampled		115	323	1,227	163	0	1,829

Lower Cedar Creek includes all waters between the mouth and the grist mill fishway (2.4 miles) while upper Cedar Creek includes all waters above the grist mill fishway.

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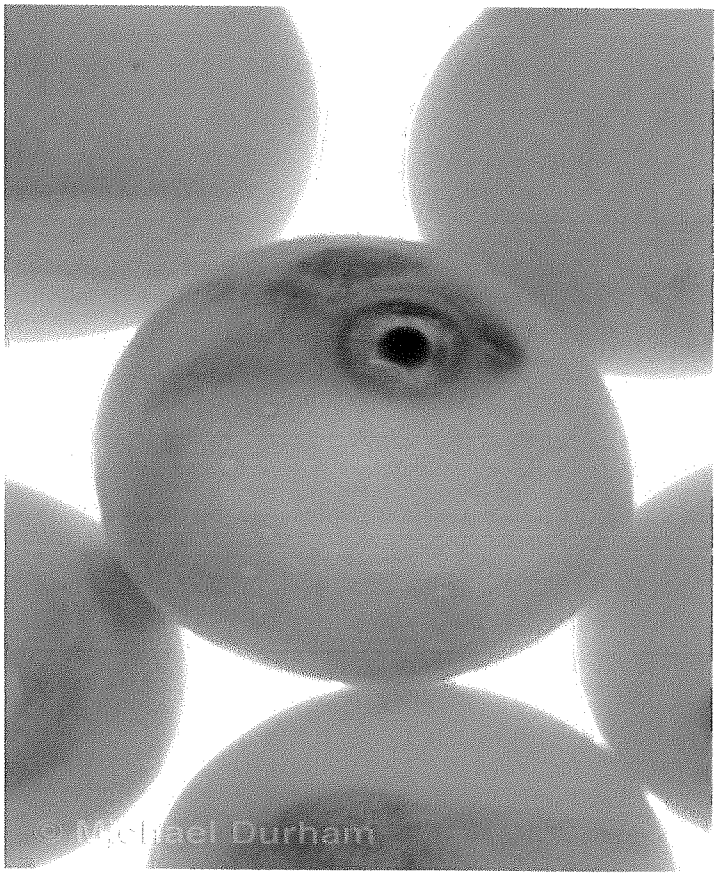
APPENDIX I - WDFW Lewis River Hatchery Complex Operations Program Report – 2015.

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
FISH PROGRAM
HATCHERIES DIVISION

LEWIS RIVER COMPLEX OPERATIONS PROGRAM
FOR
JANUARY 1, 2015 TO DECEMBER 31, 2015



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OPERATIONS PROGRAM

LEWIS RIVER HATCHERY

FOR

January 1, 2015 TO DECEMBER 31, 2015

Washington Department of FISH and WILDLIFE

WRITTEN AND COMPILED BY:

LEWIS RIVER HATCHERY STAFF

Introduction

The Lewis River Salmon Hatchery is located approximately eight miles east of Woodland, WA. on the North Fork of the Lewis River. Originally constructed in 1909 on Johnson Creek, the hatchery was moved to its present site in 1923.

Program Goals

- 1,250,000 yearling Spring Chinook at 8 to 12 fpp released into the North Fork Lewis River.
- 1,100,000 yearling Early Coho at 16 fpp released into the North Fork Lewis River.
- 900,000 yearling Late Coho at 16 fpp released into the North Fork Lewis River.

Approximately 29,000 gallons of water per minute can be delivered to the hatchery system by eight pumps that are located at two separate intakes. Four booster pumps permit further distribution of water to other areas of the facility as needed. Three gas stabilization towers and one packed column are available to remove supersaturated gases from the water supply when necessary.

There is approximately 312,000 cubic feet of available rearing space. This space consists of 14 super raceways and 12 standard raceways. Adult holding space consists of 4 large concrete ponds with a common center channel totaling 53,000 cubic feet.

The incubation facility houses fifty stacks (16 trays/stack) of vertical incubators. There are also four shallow troughs.

The Lewis Hatchery facility also includes three residences, hatchery/office building, freezer building, two three bay storage buildings, two small storage buildings, public restroom, two intake structures, two generator/pump control buildings, two compressor buildings a two-story adult handling facility and a domestic water pump house.

Lewis River hatchery is staffed with a FHS 4, FHS 3, three FHS 2s and a FHT.

TRAPPING

The Merwin Fish Collection Facility (F.C.F.) and the Lewis Ladder operate continuously. The fish trapped are sorted for broodstock needs, identification and processing; either in the trap, at Merwin Hatchery, or at Lewis River Hatchery.

2016 Brood Lewis River Summer Steelhead

The first summer steelhead was trapped at Merwin F.C.F. on April 8th, 2015. The first summer steelhead trapped at the Lewis Ladder was on July 2nd, 2015. Steelhead utilized for broodstock were collected and shipped to Merwin Hatchery from July 2nd through October 5th, 2015.

Total Trapped (F.C.F.)	4,442
Total Trapped (Lewis)	180
Recycled	1,002
Trap Mortality	34
Broodstock Shipped	339
Food Banks	2,016
Tribes	1,231
Landfill	34

2016 Brood Lewis River Winter Steelhead

The first winter steelhead was trapped at Merwin F.C.F. on November 4th, 2015. The first winter steelhead trapped at the Lewis Ladder was on November 23rd, 2015. Steelhead utilized for broodstock were collected and shipped to Merwin Hatchery from December 7th through December 28th, 2015.

Total Trapped (F.C.F.)	771
Total Trapped (Lewis)	403
Recycled	0
Trap Mortality	0
Broodstock Shipped	82
Food Banks	1,077
Tribes	15

2015 Brood Lewis River Spring Chinook

The first spring Chinook trapped at the Merwin F.C.F. was March 27th, 2015. The first arrival at the Lewis Ladder was May 11th, 2015. All broodstock was collected at both trapping sites and shipped to Speelyai Hatchery.

Adults Trapped (F.C.F.)	662
Jacks Trapped (F.C.F.)	28
Adults Trapped (Lewis)	209
Jacks Trapped (Lewis)	14
Recycled (Adults)	1
Recycled (Jacks)	1
Trap Mortality	2
Broodstock Shipped (Adults)	836
Broodstock Shipped (Jacks)	41
Planted-Trap efficiency study (Adults)	32
Planted-Trap efficiency study (Jacks)	1
Food Banks (Adults)	0
Food Banks (Jacks)	0
Landfill (Adults)	267
Landfill (Jacks)	24
Fish First (Adults)	569
Fish First (Jacks)	36

2015 Brood Lewis River (Type S) Early Coho

The first early Coho trapped at Merwin F.C.F. was August 20th, 2015. The first arrival at the Lewis Ladder was August 21st, 2015. All broodstock was collected at both trapping sites and shipped to Speelyai Hatchery.

Adults Trapped (F.C.F.)	485
Jacks Trapped (F.C.F.)	475
Adults Trapped (Lewis)	3,154
Jacks Trapped (Lewis)	986
Trap Mortality (Adults)	631
Trap Mortality (Jacks)	30
Broodstock Shipped (Adults)	1,972
Broodstock Shipped (Jacks)	73
Shipped to Swift (Adults)	223
Shipped to Swift (Jacks)	4
Food Banks (Adults)	490
Food Banks (Jacks)	1,338
Tribes (Adults)	174
Tribes (Jacks)	13
Fish First (Adults)	149
Fish First (Jacks)	3
Landfill/Disposed (Adults)	631
Landfill/Disposed (Jacks)	30

2015 Brood Lewis River (Type N) Late Coho

The first late Coho trapped at Merwin F.C.F. was October 19th, 2015. The first arrival at the Lewis Ladder was on October 19th, 2015. All broodstock was collected at the Lewis Ladder and shipped to Speelyai Hatchery.

Adults Trapped (F.C.F.)	1,609
Jacks Trapped (F.C.F.)	422
Adults Trapped (Lewis)	11,511
Jacks Trapped (Lewis)	1,996
Trap Mortality (Adults)	794
Trap Mortality (Jacks)	45
Spawned (Adults)	3,621
Spawned (Jacks)	30
Food Banks (Adults)	3,123
Food Banks (Jacks)	2,304
Fish First (Adults)	4,450
Fish First (Jacks)	51
Landfill (Adults)	0
Landfill (Jacks)	0
Amer. Canad. (Mortality-Adults)	794
Amer. Canad. (Mortality-Jacks)	45
Broodstock Shipped (Adults)	1,698
Broodstock Shipped (Jacks)	2
Shipped to Swift (Adults)	3,055
Shipped to Swift (Jacks)	16

INCIDENTAL TRAPPING

2015 Brood Lewis River Wild Winter Steelhead

Below is a list of fish trapped in the 2015 season. All live fish were shipped to Merwin Hatchery to be spawned.

Adults Trapped (F.C.F.)	88
Adults Trapped (Lewis)	0
Mortality	0
Returned to Stream	0
Broodstock Shipped	62
Shipped to Swift	26

2016 Brood Lewis River Wild Winter Steelhead

All live fish were shipped to Merwin Hatchery to be spawned.

Adults Trapped (F.C.F.)	3
Adults Trapped (Lewis)	0
Mortality	0
Returned to Stream	3

2016 Brood Lewis River Wild Summer Steelhead

The first wild summer steelhead was trapped at Merwin F.C.F. on July 6th, 2015. There were no fish trapped at Lewis Ladder.

Adults Trapped (F.C.F.)	23
Adults Trapped (Lewis)	0
Mortality	0
Returned to Stream	23

2015 Brood Lewis River Wild Spring Chinook

The first wild spring Chinook was trapped at Merwin F.C.F. on March 27th, 2015. The first arrival at the Lewis Ladder was on May 11th, 2015. All fish were shipped to Speelyai to be spawned.

Adults Trapped (F.C.F.)	28
Jacks Trapped (F.C.F.)	5
Adults Trapped (Lewis)	9
Jacks Trapped (Lewis)	0
Mortality	0
Returned to Stream (Adults)	0
Returned to Stream (Jacks)	0

2015 Brood Lewis River Wild Fall Chinook

The first wild fall Chinook was trapped at Merwin F.C.F. on September 1st, 2015. The first arrival at the Lewis Ladder was September 21st, 2015. All live fish were top caudal marked and returned to stream.

Adults Trapped (F.C.F.)	242
Jacks Trapped (F.C.F.)	30
Adults Trapped (Lewis)	22
Jacks Trapped (Lewis)	0
Mortality	2
Mortality (Jacks)	0
Returned to Stream (Adults)	262
Returned to Stream (Jacks)	30

2015 Brood Lewis River Fall Chinook

The first fall Chinook was trapped at Merwin F.C.F. on August 21st, 2015. The first arrival at the Lewis Ladder was August 21st, 2015.

Adults Trapped (F.C.F.)	524
Jacks Trapped (F.C.F.)	9
Adults Trapped (Lewis)	555
Jacks Trapped (Lewis)	5
Mortality	72
Food Banks (Adults)	1,002
Food Banks (Jacks)	11
Tribes (Adults)	4
Tribes (Jacks)	0
Landfill	72
Returned to Stream (Adults)	1
Returned to Stream (Jacks)	2

2015 Brood Lewis River Wild Early Coho

The first wild early Coho was trapped at Merwin F.C.F. was August 31st, 2015. The first arrival at the Lewis Ladder was August 31st, 2015.

Adults Trapped (F.C.F.)	57
Jacks Trapped (F.C.F.)	17
Adults Trapped (Lewis)	39
Jacks Trapped (Lewis)	0
Mortality	2
Shipped to Swift (Adults)	94
Shipped to Swift (Jacks)	17
Returned to Stream (Adults)	0

2015 Brood Lewis River Wild Late Coho

The first wild late Coho was trapped at Merwin F.C.F. on October 20th, 2015. The first arrival at the Lewis Ladder was October 26th, 2015. All of these fish were spawned at Lewis River Hatchery for Fish First egg boxes. The remainder of these fish were marked and returned to stream.

Adults Trapped (F.C.F.)	26
Jacks Trapped (F.C.F.)	14
Adults Trapped (Lewis)	35
Jacks Trapped (Lewis)	2
Mortality (F.C.F.)	0
Mortality (Lewis)	0
Broodstock Shipped (Adults)	17
Broodstock Shipped (Jacks)	5
Shipped to Swift (Adults)	11
Shipped to Swift (Jacks)	9
Returned to Stream (Adults)	5
Returned to Stream (Jacks)	2
Spawned	28
On hand (at time of report)	0

2014 Lewis River Wild Sockeye

The first arrival was trapped at Merwin F.C.F. on July 1st, 2015. The first arrival at the Lewis Ladder was July 20th, 2015. All live fish were top caudal marked and returned to stream.

Adults Trapped	32
Mortality	1
Returned to Stream	33

ADULT TRAPPING - LEWIS LADDER TRAP

SPECIES	ESTIMATED TRAPPED/RECEIVED		RETURNED TO STREAM			RECYCLED FISH TRAPPED			RECYCLED FISH RETURNED TO STR.			SHIPPED / PLANTED			MORTALITIES			CARCASS DISTRIBUTION			LETHAL SPAWNED				LIVE SPAWNED				ESTIMATED ON-HAND	
	A	J	M	F	J	M	F	J	M	F	J	M	F	J	M	F	J	M	F	J	M	VF	NVF	J	M	VF	NVF	J	A	J
CH:NA:LEWI:15:W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO:NO:LEWI:15:H	11,511	1,996	0	0	0	0	0	0	0	0	0	1710	1616	12	333	449	41	2,849	920	1,913	1791	1830	13	30	0	0	0	0	0	0
CO:SO:LEWI:15:H	3,154	986	0	0	0	0	0	0	0	0	0	935	898	46	237	341	18	481	113	919	73	76	0	3	0	0	0	0	0	0
CK:FA:LEWI:15:W	22	0	0	0	0	0	0	0	0	0	0	17	3	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CT:SR:LEWI:15:W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SO:NA:LEWI:15:W	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CK:SP:LEWI:15:H	209	14	1	0	1	0	0	0	0	0	0	114	92	13	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CK:SP:LEWI:15:W	9	0	0	0	0	0	0	0	0	0	0	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO:NO:LEWI:15:W	35	2	2	3	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	12	16	0	0	0	0	0	0	0	0
CO:SO:LEWI:15:W	39	0	0	0	0	0	0	0	0	0	0	27	10	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SH:SU:LEWI:15:H	180	0	32	31	0	4	8	0	0	0	0	0	0	0	0	0	0	65	52	0	0	0	0	0	0	0	0	0	0	0
SH:SU:LEWI:15:W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SH:WI:LEWI:15:H	403	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	196	207	0	0	0	0	0	0	0	0	0	0	0
SH:WI:LEWI:15:W	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SH:WI:LEWI:15:H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CK:FA:NA:15:H	555	5	0	1	0	0	0	0	0	0	0	0	0	0	17	14	0	307	216	5	0	0	0	0	0	0	0	0	0	0

MARKS RECOVERED			ESTIMATED EGGS TAKEN
M	F	J	
0	0	0	0
520	327	170	4,340,949
221	80	97	20,942
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

Egg Take and Incubation

2014 Brood Lewis River Late Coho (Integrated and Segregated)

Egg inventory and distribution was as follows:

Total Egg Take (green)	3,305,396
Egg Loss	196,950
Short/Over	-8,791
Adjusted Egg Take	3,296,605
Total Eyed Eggs	1,649,598
Shipped	2,089,307
Fecundity	3,046

Once the eggs develop a strong eye they are shocked then picked to remove egg mortality. After the morbid eggs are removed, the eyed eggs were re-inventoried and laid down to hatch or ship. Total eggs loss (roughly 10.7%) was 196,950. 1,010,348 of the eyed eggs were integrated and kept on station for the Lewis River Program. A total of 2,122,817 segregated late Coho eggs were shipped out. Washougal Hatchery received 1,450,057green eggs and 639,250 eyed eggs were given to Coops. Coop eggs were distributed in the months of January and February 2015 as followed: Fish First 460,000; Venersborg Firefighters 90,000; Clark County PUD 60,000; Columbia Springs 14,250; Ridgefield High School 10,000; The Steve Syverson Project 5,000.

2014 Brood Lewis River Late Coho (Wild)

Egg inventory and distribution was as follows:

Total Egg Take (green)	283,220
Egg Loss	40,098
Short/Over	-15,986
Adjusted Egg Take	267,234
Total Eyed Eggs	227,136
Shipped	227,136
Fecundity	3,293

The eggs were shocked and picked to remove egg mortality prior shipping. Egg loss was at 15%. During the months of January and February 227,136 eyed eggs were transferred to Fish First and distributed into egg boxes.

2015 Brood Lewis River Early Coho

Egg inventory and distribution was as follows:

Total Egg Take (green)	53,658
Egg Loss	35,574
Short/Over	-107
Adjusted Egg Take	52,488
Total Eyed Eggs	16,823
Shipped	16,823
Fecundity	2,736
Eye Eggs Received (from Speelyai)	1,128,814

On a typical year early adult Coho brood are held and spawned at Speelyai Hatchery. But because the 2015 return of early Coho ended up below average region wide, fish management requested that Lewis River Hatchery take extra eggs to cover inevitable egg shortages in the region. To accommodate the mandate, early Coho that came into the trap ripe were spawned at LRH and the eggs incubated up to the eyed stage. Overall egg quality was poor, mortality was 67.7 %. All eggs taken at LHR were shipped to Washougal eyed. Green Coho caught in the trap were transferred to and spawned at Speeylai. 1,128,814 eyed eggs were transferred back to the Lewis River Hatchery in November 2015.

2015 Brood Lewis River Late Coho (Integrated & Segregated)

Egg inventory and distribution was as follows:

Total Egg Take (green)	4,772,532
Egg Loss	0
Destroyed	0
Shipped	2,301,108
Fecundity	2,387

The last egg take (spawn) for the 2015 season occurred on December 22nd. Over 4.7 million green eggs were taken in 2015, 1.4 million more than the previous year. Fish management requested Lewis River hatchery to take extra eggs to cover egg shortfalls elsewhere in the region. During the month of December 2.3 million green eggs were shipped to the Washougal Salmon Hatchery. Lewis River Hatchery currently has 2.47 million green eggs on hand. The integrated eggs are for the Lewis River program. Segregated eyed eggs beyond Lewis River production needs will be distributed to Klickitat Hatchery, Fish First, Clark County PUD, Columbia Springs, and the Steve Syverson Project.

2015 Brood Lewis River Late Coho (wild)

No eggs were taken. All wild adults captured were used for the Lewis River integrated late Coho program.

REARING PROGRAM

2013 Brood Lewis River Spring Chinook

New release strategies for the 2013 spring Chinook were implemented with the intent to improve fish health by reducing the rearing mortality rate and ultimately producing a better smolt. The spring Chinook program on the Lewis River was divided into three groups. Two groups reared and released at Lewis River Hatchery (LRH) and the third reared at Speelyai Hatchery and then trucked down to the lower river for release.

The LRH groups consisted of an October release at 12 fish per pound (fpp) and a February release at 8 fpp. LRH received 875,030 juveniles at 90 fpp from Speelyai Hatchery in May of 2014. Prior to the transfer, the fish were mass marked and tagged at Speelyai. Each of the three release groups was differentially tagged. Approximately 150K of this stock was identified as AD+CWT, 150K as CWT only (double index group), and the rest as AD only.

The October release group did very well. At time of release these fish were going into a strong smolt and the total rearing mortality was very low, at 0.65%. The early group was volitionally released between October 1st and the 17th, 2014 totaling 430,303 at 11.5fpp. During the release a hydraulic anomaly occurred which stopped flow to a neighboring pond killing 141,973 spring Chinook. Those lost were part of the February release group. The cause of this unfortunate event has been identified, addressed, and measures have been taken to insure it does not happen again.

The February groups did not fare as well. The total rearing mortality for the LHR group was 19.42%, almost thirty times higher than the October group. The spring Chinook at Speelyai had significant health issues as well and ended up being transported to LRH in December and January. The thought was a February release from the LRH raceways into the Lewis River would be less stressful on the fish than planting directly from a truck. The LRH February group was released between February 1st and 3rd 2015. The LRH group totaled 217,805 and was 7.7 fpp at release. Speelyai's group was released between February 3rd and 6th 2015 for a total of 468,756 averaging 12.2 fpp.

Final Stock Inventory

Fish Received	1,364,465
Pounds Received	43,751
Rearing Mortality (8.6%)	-105,628
Fish Planted	1,116,864
Pounds Planted	104,102
Feed Fed (lbs.)	57,332
Net Gain (lbs.)	60,351
Conversion	0.94:1
CV	11.7

2014 Brood Lewis River Spring Chinook

The Lewis River Hatchery received 1,327,120 spring Chinook at 89 fpp from Speelyai Hatchery on May 4th & 5th, 2015. The fish were mass marked and differentially tagged at Speelyai Hatchery prior to transfer. Approximately 150K of this stock was identified as AD+CWT, 150K as CWT only (double index group), and the rest as AD only.

Two release strategies for the 2014 spring Chinook were implemented similar to that of the 2013 spring Chinook release, a release group in October at 12fpp and a February release group at 8fpp. Because the October release from the previous year's brood did so much better than the February, a larger portion of the 2014 brood was scheduled for an October release.

The 2015 region wide drought was rough for rearing fish, particularly the spring Chinook. The low flows and warmer than average river conditions brought with it higher than normally fish pathogens. With an increase in pathogens came an increase in sick fish and formalin treatments. By late summer and after hundreds of gallons of formalin treatments the hatchery pathologist requested an emergency early release.

The early release occurred August 3rd 2015, liberating 466,890 spring Chinook at 20.7 fpp. The early release allowed for lower pond densities of the remaining fish which improved the overall health of the fish. On October 1st 661,020 at ll.5 fpp were released. The fish released in October were healthy, smolted and ready to migrate.

After the October release 144,703 spring Chinook remained for release in February 2016. By the end of December that number was reduced due to rearing mortality to 126,594. The mortality rate for the early releases groups (4.03%) in comparison to the February group (16.65%) was much lower.

Stock Inventory This Period

Fish Received	1,327,120
Pounds Received	14,890
Rearing Mortality (5.4%)	-72,616
Planted	1,127,910
Pounds Planted	79,925
Fish on Hand	126,594
Pounds on Hand	14,066
Feed Fed (lbs.)	60,916
Net Gain (lbs.)	79,101
Conversion	0.77:1

2013 Brood Lewis River Early Coho

Lewis River Hatchery volitionally released 1,178,986 early Coho averaging 16.2 fpp between April 1st and 8th, 2015. Approximately 75K was identified with an AD+CWT, 75K was CWT only (double index group) and the rest with an AD clip only.

Final Stock Inventory

Beginning Balance	1,338,672
Pounds Ponded	888
Rearing Mortality (7.5%)	-95,701
Adjustment	-63,985
Fish Planted	1,178,986
Pounds Planted	72,869
Feed Fed (lbs.)	66,366
Net Gain (lbs.)	71,981
Conversion	0.92:1
CV	7.80

2013 Brood Lewis River Late Coho

Lewis River Hatchery volitionally released 969,998 late Coho averaging 16.7 fpp between April 1st and 10th, 2015. Approximately 75K was identified with an AD+CWT, 75K was CWT only (double index group) and the rest with an AD clip only.

Final Stock Inventory

Beginning Balance	955,976
Pounds Ponded	706
Rearing Mortality (3.3%)	-33,538
Adjustment	47,560
Fish Planted	969,998
Pounds Planted	57,805
Feed Fed (lbs.)	49,884
Net Gain (lbs.)	57,099
Conversion	0.87:1
CV	7.59

2014 Brood Lewis River Early Coho

The last take of early Coho was moved from inside the incubation room to a small, outside raceway on February 5th, 2015. Marking of these fish occurred in June 2015. Approximately 75K was identified with an AD+CWT, 75K was CWT only (double index) and the rest AD clip only.

The early Coho are normally transferred from the small raceways (1-12) up to the larger ones at pond 16 shortly after being marked. Construction work on the downstream intake during the summer of 2015 prohibited the pumping of water to those raceways and alternative rearing space was needed. Fortunately Kalama Falls Hatchery (KFH) had enough rearing space for 780K early Coho. The 780K was transferred between June 3rd and the 18th. The remaining 500K was distributed between raceways 1 through 12.
Once the spring Chinook were released in early October more rearing space became available.

The Coho held at Kalama Falls over the summer months were transferred back (October 14th through 16th) to LRH and put into to the large raceways at ponds 13 and 14. The early Coho in the small raceways were moved to 13 and 14 as well.
The 2014 early Coho are scheduled for release starting in April 2016.

Stock Inventory This Period

Beginning Balance	1,318,846
Pounds Ponded	1,027
Fish Shipped	780,208
Pounds Shipped	6,490
Fish Received	775,825
Pounds Received	21,608
Rearing Mortality (7.4%)	-73,444
Adjustment	12,316
Fish on Hand	1,257,718
Pounds on Hand	60,514
Feed Fed (lbs.)	49,642
Net Gain (lbs.)	59,487
Conversion	0.83:1

2014 Brood Lewis River Late Coho

A total of 1,010,348 fry were ponded between March 5th and April 7th, 2015. Marking of these fish took place in June 2015. Approximately 75K was identified with an AD+CWT, 75K was CWT only (double index) and the rest AD clip only.

The late Coho are typically moved from the small raceways (1-12) up to the larger ones at pond 16 shortly after being marked. Construction work on the downstream intake during the summer of 2015 prohibited the pumping of water to those raceways and alternative rearing space was needed.

Speelyai Hatchery had some extra space available during the summer so a portion of the late Coho was relocated there. In early July a little over 300k was transferred to Speelyai and held until October. The remaining 700K was distributed between raceways 1 through 12 for the summer.

After the spring Chinook were released in early October, the late Coho being held at Speelyai and the ones in the small raceways were transferred to large raceways at 13 and 14. The 2014 late Coho are scheduled for release starting in April 2016.

Stock Inventory This Period

Beginning Balance	1,010,348
Pounds Ponded	718
Fish Shipped	304,224
Pounds Shipped	2,426
Fish Received	303,430
Pounds Received	8,245
Rearing Mortality (4.2%)	-41,535
Rearing Adjustment	-28,555
Fish on Hand	940,258
Pounds on Hand	44,945
Feed Fed (lbs.)	37,783
Net Gain (lbs.)	44,227
Conversion	0.86:1

2015 Brood Lewis River Early Coho

The first take of early Coho, 385,458, were moved from the incubation room to a raceway on December 24th, 2015. The rest of the takes will be ponded in January and February of 2016.

Stock Inventory This Period

Beginning Balance	385,458
Pounds Ponded	246
Rearing Mortality (3.0%)	-11,626

RAINFALL REPORT

Hatchery: Lewis River **Year: 2015** **Water Source: Lewis River**

	0	0.7	0	0	0.9	0	0	0	0.2	0	0.8	0.7	
	0	0.2	0	0	0.3	0	0	0	0.2	0	0	0.6	
	0.4	0.2	0	0	0	0	0	0	0.1	0	0	0.6	
	3.3	0.2	0	0	0	0	0	0	0	0	0	0.3	
	0.2	1.4	0	0.35	0	0	0	0	0	0	0.3	1	
	0	1.1	0	0	0	0	0	0	0.2	0.2	0	1.8	
	0	0.8	0	0	0	0	0	0	0	0.2	0	1.1	
	0	0.3	0	0	0	0	0	0	0	0	1	3	
	0	1.3	0	0	0	0	0	0	0	0	0.2	1.1	
	0.1	0	0	0	0	0	0	0	0	0.5	0	0.8	
	0.2	0	0.2	1.1	0	0	0	0	0	0	0.25	0.9	
	0	0	0.4	0.7	0	0	0	0	0	0	0.15	1.3	
	0	0	0.8	0.1	0	0	0	0	0	0	0.85	0.7	
	0	0	2.4	0	0	0	0	0.01	0.1	0	0.9	0.1	
	0.8	0	0.3	0	0	0	0	0	0	0	0.6	0.6	
	0.2	0	0	0	0	0	0	0	0.3	0	0.1	0.6	
	1.9	0	0.1	0	0	0	0	0	0.1	0.2	3.5	1.5	
	0.2	0	0	0	0	0	0	0	0	0.7	1.25	0.3	
	0	0.1	0	0	0	0	0	0	0	0.2	0.6	0.5	
	0	0	0.4	0	0	0	0	0	0	0	0.1	1.2	
	0	0	0	0	0	0	0	0	0	0	0	0.3	
	0	0	0.65	0	0	0	0	0	0	0	0	0.85	
	0.25	0	0.9	0	0	0	0	0	0.2	0	0	1.25	
	0.1	0.1	0.45	0	0	0	0.4	0	0.1	0.9	0.7	0.15	
	0	0.4	0.1	0	0	0	0.1	0	0	0	0	0.05	
	0	0.6	0	0	0	0	0	0.1	0	0	0	0.05	
	0.2	0.1	0.2	0	0	0	0	0.6	0	0.1	0	0.3	
	0	0	0	0	0	0	0	1.3	0	0.7	0	0.1	
	0		0	0	0	0	0	0.1	0	1.2	0	0.2	
	0		0.2	0.05	0	0	0	0	0	1.7	0.2	0	
	0		0.2		0		0	0		1.8		0	Year Total
													72.1

YEARLY TEMPERATURE REPORT

HATCHERY: LEWIS RIVER YEAR: 2015 WATER SOURCE: N.F. LEWIS RIVER

	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	45	44	43	43	45	44	46	45	50	46	50	49	58	53	62	56	60	58	62	59	62	61	52	51
2	44	44	44	42	45	44	46	45	50	46	51	49	58	53	58	56	61	58	60	59	61	60	52	51
3	45	44	44	43	45	44	46	45	50	46	51	49	58	53	60	58	60	57	60	59	61	59	52	51
4	45	44	44	44	45	44	46	45	49	47	53	49	59	53	61	56	61	58	62	59	60	60	51	50
5	45	45	44	44	45	44	46	45	49	47	53	49	59	54	61	56	60	58	62	59	60	60	50	49
6	45	44	44	44	46	44	46	45	49	46	53	49	58	54	61	56	59	58	61	59	60	59	50	49
7	44	44	44	44	46	44	46	45	50	46	54	49	58	54	62	56	62	58	61	60	60	59	50	49
8	44	44	44	44	46	44	46	45	51	47	54	49	59	54	60	58	62	58	62	60	60	59	49	48
9	44	44	44	44	46	44	46	45	51	47	54	49	58	54	62	56	62	58	61	60	60	59	49	48
10	44	44	44	44	46	44	46	45	49	47	54	49	56	54	61	57	62	58	61	60	59	58	49	48
11	44	44	44	43	45	44	45	45	48	47	54	49	55	54	62	57	62	58	62	60	59	58	49	48
12	45	44	44	43	46	44	46	45	48	48	54	50	58	55	62	57	62	59	62	60	59	59	49	48
13	44	44	44	43	45	44	46	45	49	47	54	50	59	54	62	57	62	58	62	59	59	58	48	47
14	44	44	44	43	45	44	47	45	51	47	55	50	60	54	59	58	60	58	62	59	59	58	47	47
15	44	44	44	43	45	44	48	45	49	47	55	50	60	55	60	57	61	59	62	59	59	58	47	47
16	45	44	44	43	46	44	48	45	48	47	55	50	59	55	62	56	61	59	62	59	59	58	47	46
17	44	44	45	44	45	44	48	45	51	47	55	50	60	55	62	57	62	59	61	60	57	56	47	46
18	44	44	45	44	46	44	49	45	52	47	55	51	60	55	62	57	62	58	62	61	57	56	47	46
19	44	43	45	44	45	44	49	45	49	48	55	51	60	55	62	58	61	58	62	61	56	55	46	46
20	44	43	45	44	45	44	49	45	51	49	54	51	60	55	61	57	62	59	62	61	56	54	46	46
21	44	43	45	44	45	44	47	46	51	48	54	52	58	54	61	56	62	59	62	61	55	54	46	46
22	43	43	45	44	45	44	47	45	49	48	55	52	58	55	61	57	62	58	62	60	54	53	46	46
23	43	43	45	44	45	44	47	46	49	48	55	52	60	55	61	57	62	58	62	60	53	53	46	45
24	44	43	45	44	45	44	47	46	50	48	56	52	59	55	62	57	60	58	62	61	53	52	46	45
25	44	43	44	44	45	44	49	46	49	48	56	52	58	55	62	57	62	59	62	61	53	52	46	45
26	44	43	44	44	46	44	47	46	50	48	57	53	59	55	62	57	62	58	62	61	52	52	45	45
27	44	43	45	44	46	44	49	46	52	48	57	53	59	55	62	58	62	58	62	61	52	52	45	45
28	44	43	45	44	45	44	49	46	52	48	55	53	59	55	62	59	62	58	62	62	53	52	45	45
29	43	43			47	45	49	46	52	48	57	55	59	56	60	58	62	58	62	62	52	52	45	44
30	43	43			46	45	49	46	52	48	57	53	61	59	61	58	62	59	62	61	52	51	46	44
31	43	43			46	45			52	49			61	56	60	58			62	61			44	44
AVG.	44.06452	43.6129	44.32143	43.64286	45.45161	44.09677	47.16667	45.3	50.06452	47.35484	54.4	50.63333	58.80645	54.6129	61.16129	57.03226	61.4	58.23333	61.70968	60.12903	57.06667	56.23333	47.64516	46.93548
MIN	43	43	43	42	45	44	45	45	48	46	50	49	55	53	58	56	59	57	60	59	52	51	44	44
MAX	45	45	45	44	47	45	49	46	52	49	57	55	61	59	62	59	62	59	62	62	62	61	52	51

Washington DEPARTMENT OF FISH AND WILDLIFE NPDES Chemical Operational Log. Records of Disease Control Chemicals Used

Keep records on station for at least five years

YEAR 2015

Facility: Lewis River Hatchery

NPDES Permit Number: WAG 13-1040

Brood Stock Species	Pond/ Raceway	Date of Application	Chemical Name	Dosage	Duration	Method Application	Amount used	Reason for use	Flow	Water Temp	Estimated Concentration Discharge	Method Disposal	location any disposed spent chemical dip	Name
CO:SO:LEWI:14:H	2	1/30	FORMALIN	1:6000	1HR	DRIP	1.5 GAL	COSTIA	150	43				DMG
CO:SO:LEWI:14:H	2	1/31	FORMALIN	1:6000	1HR	DRIP	1.5 GAL	COSTIA	150	43				DMG
CO:SO:LEWI:14:H	2	2/4	FORMALIN	1:6000	1HR	DRIP	1.5 GAL	COSTIA	150	43				AES
CO:SO:LEWI:14:H	3	2/17	FORMALIN	1:6000	1HR	DRIP	1.5 GAL	COSTIA	150	43				DMG
CO:SO:LEWI:14:H	4	2/17	FORMALIN	1:6000	1HR	DRIP	1.5 GAL	COSTIA	150	43				DMG
CO:SO:LEWI:14:H	3	2/18	FORMALIN	1:6000	1HR	DRIP	1.5 GAL	COSTIA	150	43				DMG
CO:SO:LEWI:14:H	4	2/18	FORMALIN	1:6000	1HR	DRIP	1.5 GAL	COSTIA	150	43				DMG
CO:SO:LEWI:14:H	6	3/24	FORMALIN	1:6000	1HR	DRIP	3 GAL	COSTIA	308	44.5				AES
CO:SO:LEWI:14:H	2	3/30	FORMALIN	1:6000	1HR	DRIP	3.6 GAL	COSTIA	364	46				DMG
CO:SO:LEWI:14:H	6	3/30	FORMALIN	1:6000	1HR	DRIP	3 GAL	COSTIA	308	46				DMG
CO:NO:LEWI:14:M	8	4/29	FORMALIN	1:6000	1HR	DRIP	1.3 GAL	COSTIA	120	47				AES
CO:NO:LEWI:14:M	11	4/29	FORMALIN	1:6000	1HR	DRIP	1.1 GAL	COSTIA	105	47				AES
CO:SO:LEWI:14:H	5	5/6	FORMALIN	1:6000	1HR	DRIP	3 GAL	COSTIA	308	48				DMG
CK:SP:LEWI:14:H	14-1	5/27	FORMALIN	1:6000	1HR	DRIP	18 GAL	PARASITES	1800	49				SC
CK:SP:LEWI:14:H	14-2	5/27	FORMALIN	1:6000	1HR	DRIP	18 GAL	PARASITES	1800	49				SC
CK:SP:LEWI:14:H	14-3	5/27	FORMALIN	1:6000	1HR	DRIP	18 GAL	PARASITES	1800	49				SC
CK:SP:LEWI:14:H	14-4	5/27	FORMALIN	1:6000	1HR	DRIP	18 GAL	PARASITES	1800	49				SC
CK:SP:LEWI:14:H	14-1	5/28	FORMALIN	1:6000	1HR	DRIP	18 GAL	PARASITES	1800	49				SC
CK:SP:LEWI:14:H	14-2	5/28	FORMALIN	1:6000	1HR	DRIP	18 GAL	PARASITES	1800	49				SC
CK:SP:LEWI:14:H	14-3	5/28	FORMALIN	1:6000	1HR	DRIP	18 GAL	PARASITES	1800	49				SC
CK:SP:LEWI:14:H	14-4	5/28	FORMALIN	1:6000	1HR	DRIP	18 GAL	PARASITES	1800	49				SC

Notes:

Washington DEPARTMENT OF FISH AND WILDLIFE NPDES Chemical Operational Log. Records of Disease Control Chemicals Used

Keep records on station for at least five years

YEAR 2015

Facility: Lewis River Hatchery

NPDES Permit Number: WAG 13-1040

Brood Stock Species	Pond/ Raceway	Date of Application	Chemical Name	Dosage	Duration	Method Application	Amount used	Reason for use	Flow	Water Temp	Estimated Concentration Discharge	Method Disposal	location any disposed spent chemical dip	Name
CK:SP:LEWI:14:H	13-2	6/2	FORMALIN	1:6000	1HR	DRIP	18 GAL	PARASITES	1800	50				SC
CK:SP:LEWI:14:H	13-3	6/2	FORMALIN	1:6000	1HR	DRIP	18 GAL	PARASITES	1800	50				SC
CK:SP:LEWI:14:H	13-4	6/2	FORMALIN	1:6000	1HR	DRIP	18 GAL	PARASITES	1800	50				SC
CK:SP:LEWI:14:H	13-2	6/2	FORMALIN	1:6000	1HR	DRIP	18 GAL	PARASITES	1800	50				SC
CK:SP:LEWI:14:H	13-3	6/2	FORMALIN	1:6000	1HR	DRIP	18 GAL	PARASITES	1800	50				SC
CK:SP:LEWI:14:H	14-3	6/29	FORMALIN	1:6000	1HR	DRIP	18 GAL	BKD	1800	49				DMG
CK:SP:LEWI:14:H	14-3	6/30	FORMALIN	1:6000	1HR	DRIP	18 GAL	BKD	1800	49				DMG
CK:SP:LEWI:14:H	14-3	7/1	FORMALIN	1:6000	1HR	DRIP	18 GAL	BKD	1800	49				DMG
CK:SP:LEWI:14:H	13-4	7/27	FORMALIN	1:6000	1HR	DRIP	18 GAL	COSTIA	1800	57				MC
CK:SP:LEWI:14:H	13-4	7/28	FORMALIN	1:6000	1HR	DRIP	18 GAL	COSTIA	1800	57				MC
CK:SP:LEWI:14:H	13-4	7/29	FORMALIN	1:6000	1HR	DRIP	18 GAL	COSTIA	1800	57				MC
CK:SP:LEWI:14:H	13-3	7/27	FORMALIN	1:6000	1HR	DRIP	18 GAL	COSTIA	1800	57				MC
CK:SP:LEWI:14:H	13-3	7/28	FORMALIN	1:6000	1HR	DRIP	18 GAL	COSTIA	1800	57				MC
CK:SP:LEWI:14:H	13-3	7/29	FORMALIN	1:6000	1HR	DRIP	18 GAL	COSTIA	1800	57				MC
CK:SP:LEWI:14:H	13-2	7/27	FORMALIN	1:6000	1HR	DRIP	18 GAL	COSTIA	1800	57				MC
CK:SP:LEWI:14:H	13-2	7/28	FORMALIN	1:6000	1HR	DRIP	18 GAL	COSTIA	1800	57				MC
CK:SP:LEWI:14:H	13-2	7/29	FORMALIN	1:6000	1HR	DRIP	18 GAL	COSTIA	1800	57				MC
CK:SP:LEWI:14:H	13-1	7/27	FORMALIN	1:6000	1HR	DRIP	18 GAL	COSTIA	1800	57				MC
CK:SP:LEWI:14:H	13-1	7/28	FORMALIN	1:6000	1HR	DRIP	18 GAL	COSTIA	1800	57				MC
CK:SP:LEWI:14:H	13-1	7/29	FORMALIN	1:6000	1HR	DRIP	18 GAL	COSTIA	1800	57				MC

Notes:

Washington DEPARTMENT OF FISH AND WILDLIFE NPDES Chemical Operational Log. Records of Disease Control Chemicals Used

Keep records on station for at least five years

YEAR 2015

Facility: Lewis River Hatchery

NPDES Permit Number: WAG 13-1040

Brood Stock Species	Pond/ Raceway	Date of Application	Chemical Name	Dosage	Duration	Method Application	Amount used	Reason for use	Flow	Water Temp	Estimated Concentration Discharge	Method Disposal	location any disposed spent chemical dip	Name
CO:SO:LEWI:14:H	13-4	9/22	FORMALIN	1:6000	1HR	DRIP	26.6 GAL	TRICADINIA	2660	61				SC
CO:NO:KALA:14:M	1	11/5	FORMALIN	1:6000	1HR	DRIP	3 GAL	TRICADINIA	300	60				MC
CO:NO:KALA:14:M	8	11/5	FORMALIN	1:6000	1HR	DRIP	3 GAL	TRICADINIA	300	60				MC
SH:WI:KALA:13:H	9	11/5	FORMALIN	1:10000	1HR	DRIP	1.8GAL	GYRO	300	60				MC
SH:WI:KALA:13:H	10	11/5	FORMALIN	1:10000	1HR	DRIP	1.8GAL	GYRO	300	60				MC
SH:WI:KALA:13:H	9	11/6	FORMALIN	1:8000	1HR	DRIP	2.5 GAL	GYRO	300	60				MC
SH:WI:KALA:13:H	10	11/6	FORMALIN	1:8000	1HR	DRIP	2.5 GAL	GYRO	300	60				MC
SH:WI:KALA:13:H	9	11/6	FORMALIN	1:6000	1HR	DRIP	3 GAL	GYRO	300	60				MC
SH:WI:KALA:13:H	10	11/6	FORMALIN	1:6000	1HR	DRIP	3 GAL	GYRO	300	60				MC
SH:WI:KALA:13:H	9	12/24	FORMALIN	1:10000	1HR	DRIP	1.8GAL	GYRO	300	45				AES
SH:WI:KALA:13:H	10	12/24	FORMALIN	1:10000	1HR	DRIP	1.8GAL	GYRO	300	45				AES
SH:WI:KALA:13:H	9	12/25	FORMALIN	1:8000	1HR	DRIP	2.5 GAL	GYRO	300	45				AES
SH:WI:KALA:13:H	10	12/25	FORMALIN	1:8000	1HR	DRIP	2.5 GAL	GYRO	300	45				AES
SH:WI:KALA:13:H	9	12/26	FORMALIN	1:6000	1HR	DRIP	3 GAL	GYRO	300	45				AES
SH:WI:KALA:13:H	10	12/26	FORMALIN	1:6000	1HR	DRIP	3 GAL	GYRO	300	45				AES

Notes:

MAINTENANCE AND CAPITAL PROJECTS – 2015

MAINTENANCE

1. **Serviced and repaired HVAC systems to resident housing**
2. **Pruned fruit trees.**
3. **Serviced and repaired forklifts.**
4. **Serviced all hatchery pumps.**
5. **Serviced all vehicles.**
6. **Serviced all air compressors.**
7. **Lawn thatched and aerated.**
8. **Repaired shower in Residence #1.**
9. **Replaced tires on Gators.**

CAPITAL

1. **Rebuilt DSI Intake.**
2. **Rebuilt walk-in Freezer.**
3. **Painted the three gas stabilization towers and one packed column.**
4. **Installed new LED lighting in feed room.**
5. **Repaired main water line to Residence #3.**
6. **Rebuilt and replaced 90% of high pressure line: ponds 13,14,15**
7. **Replaced and upgraded one bus bar connector on pond 15 center channel crowder.**

OPERATIONS PROGRAM

MERWIN HATCHERY

FOR

January1, 2015 TO DECEMBER 31, 2015

Washington Department of FISH and WILDLIFE

WRITTEN AND COMPILED BY:

MERWIN HATCHERY STAFF

Introduction

The Merwin Hatchery is a PacifiCorp owned and funded facility that is operated by the State of Washington's Department of Fish and Wildlife. The facility has been in operation since October of 1993.

Merwin Hatchery is located 11 miles east of Woodland off state route 503 adjacent to the PacifiCorp Merwin Dam and Lake Merwin.

Mitigation goals for fish production are;

* 50,000 Rainbow Trout at 2.5 fpp stocked into Swift Reservoir.

* 175,000 summer Steelhead at 4.8 fpp stocked into N.F. Lewis River.

* 100,000 winter Steelhead at 4.8 fpp stocked into N.F. Lewis River.

* 50,000 wild winter Steelhead at 6 fpp stocked into N.F. Lewis River.

Approximately 5,000 gallons of water per minute can be delivered to the hatchery by three-intake pumps located midway on Merwin Dam, which draft water from Lake Merwin. Two screened intakes located at depths of approximately fifteen feet and ninety feet below the surface of the reservoir enable some temperature manipulation for fish rearing.

Ozone water sterilization is part of the design criteria to meet fish health needs not only at the hatchery but also for fish stocks and the Lewis River Hatchery downstream of our effluent discharge area. Two ozone generators fed by compressed air (or liquid oxygen in the event of compressor failure), supply ozone gas to a water/ozone contact chamber. A maximum flow of 3,800 gallons per minute can be sterilized and supplied to the hatchery building, raceways and rearing ponds. The facility has the capability to ozone treat all effluent water from the adult holding area and incubation room in the event of a viral outbreak.

There is approximately 216,470 cubic feet of rearing space. These areas consist of four one-quarter acre rearing ponds, ten 9.5 x 80 x 2.5 fingerling raceways, four 7.5 x 33 x 4 adult holding ponds, six 4.5 x 34 x 2 intermediate raceways, one 3x14x2 deep trough, four 16 c.f. fry troughs and 15 double stack Mari Source incubators.

The hatchery complex has an operations building housing the office, feed room, shop, lab, day room, locker room, shower room, mud room, crew rest room and public restrooms. Other buildings associated with this facility are; the hatchery building with attached covered adult holding ponds, water treatment facility including the ozone generator building/ contactor structure, one three bay storage building, chemical storage building and three residences.

Trapping

During this reporting period, trapping was conducted at the Merwin Dam Fish Collection Facility, Lewis River Hatchery, Cedar Creek Trap and the lower river, depending on the species.

2016 Brood Lewis River Summer Steelhead

A total of 341 adults were received for spawning purposes. All of these fish were trapped at the Merwin Dam Fish Collection Facility. Disposition is as follows:

Adults Spawned	202
Non-Viable females	4
Mortality (15.2%)	52
Nutrient Enhancement	0

2016 Brood Lewis River Winter Steelhead

A total of 126 adults were received for spawning purposes. Of these, 13 pair were stripped and gametes donated to Cyrocyte Inc. for cryogenic testing. These fish were trapped at the Merwin Dam Fish Collection Facility. Disposition is as follows:

Adults Spawned	72
Adults Stripped for Cyrocyte Inc.	26
Non Viable females	0
Mortality (9.5%)	12
Nutrient Enhancement	0

2015 Brood Lewis River Wild Winter Steelhead

A total of 62 adults were received for spawning purposes. These fish were collected at various sites, to include: the Merwin Dam Fish Collection Facility, Cedar Creek Trap, and tangle net fishing in the lower river. Disposition is as follows:

Adults Spawned	50
Non Viable Females	0
Mortality (0.0%)	0
Nutrient Enhancement	0
Return to river	62

2015 Brood Lewis River Late Winter Steelhead Hatchery Origin

This stock is a result of live spawning wild broodstock winter steelhead at Merwin Hatchery collected from the Merwin F.C.F., tangle netting in the lower river, the Lewis River Ladder, and Cedar Creek Trap. These fish are reared at Merwin Hatchery and blank wire tagged as juveniles. Then, are transported upstream by PacifiCorp staff as part of a supplementation project when they return as adults.

Below is a list of fish trapped in the 2015 season. The first arrival at Merwin F.C.F. was on January 1st, 2015. All live fish were planted at Eagle Cliff release site at the upper end of Swift Reservoir. Nine of these fish were shipped to Merwin Hatchery and surplussed in efforts to identify snout tag.

Adults Trapped (F.C.F.)	1,273
Mortality	4
Planted	1,260
Shipped to Merwin Hatchery	9

MERWIN HATCHERY ADULT COLLECTION

SPECIES	ESTIMATED TRAPPED/RECEIVED		RETURNED TO STREAM			RECYCLED FISH TRAPPED			RECYCLED FISH RETURNED TO STR.			SHIPPED / PLANTED			MORTALITIES			CARCASS DISTRIBUTION			LETHAL SPAWNED				LIVE SPAWNED				ESTIMATED ON-HAND		MARKS RECOVERED			ESTIMATED EGGS
	A	J	M	F	J	M	F	J	M	F	J	M	F	J	M	F	J	M	F	J	M	VF	NVF	J	M	VF	NVF	J	A	J	M	F	J	TAKEN
SH:SU:LEWI:16:H	341	0	0	0	0	0	0	0	0	0	0	0	0	0	15	37	0	58	25	0	101	101	4	0	0	0	0	0	0	0	0	0	0	414,100
SH:WI:LEWI:16:H	126	0	0	0	0	0	0	0	0	0	0	0	0	0	3	9	0	11	5	0	49	49	0	0	0	0	0	0	0	0	0	0	0	147,600
SH:WL:LEWI:15:H	62	0	29	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	25	0	0	0	0	0	0	0	107,780

ADULT TRAPPING - MERWIN DAM FISH COLLECTION FACILITY

SPECIES	ESTIMATED TRAPPED/RECEIVED		RETURNED TO STREAM			RECYCLED FISH TRAPPED			RECYCLED FISH RETURNED TO STR.			SHIPPED / PLANTED			MORTALITIES			CARCASS DISTRIBUTION			LETHAL SPAWNED				LIVE SPAWNED				ESTIMATED ON-HAND	
	A	J	M	F	J	M	F	J	M	F	J	M	F	J	M	F	J	M	F	J	M	VF	NVF	J	M	VF	NVF	J	A	J
CH:NA:LEWI:15:W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO:NO:LEWI:15:H	1614	422	13	0	0	1	0	0	0	0	0	732	687	6	9	3	4	121	49	412	0	0	0	0	0	0	0	0	0	0
CO:SO:LEWI:15:H	485	475	13	9	0	1	0	0	0	0	0	120	221	31	52	1	12	67	3	432	0	0	0	0	0	0	0	0	0	0
CK:FA:LEWI:15:W	242	30	0	0	0	2	5	0	2	5	0	104	138	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CT:SR:LEWI:15:W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SO:NA:LEWI:15:W	32	0	0	0	0	0	0	0	0	0	0	17	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CK:SP:LEWI:15:H	662	28	0	0	0	0	0	0	0	0	0	349	313	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CK:SP:LEWI:15:W	28	5	0	0	0	0	0	0	0	0	0	15	13	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO:NO:LEWI:15:W	26	14	0	0	0	0	0	0	0	0	0	16	10	14	0	0	0	0	0	0	19	9	0	0	0	0	0	0	0	0
CO:SO:LEWI:15:W	57	17	0	0	0	0	0	0	0	0	0	24	33	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SH:SU:LEWI:16:H	4,442	0	0	0	0	0	0	0	0	0	0	440	838	0	7	27	0	1,267	1,863	0	0	0	0	0	0	0	0	0	0	0
SH:SU:LEWI:16:W	24	0	0	0	0	0	0	0	0	0	0	8	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SH:WI:LEWI:16:H	771	0	0	0	0	0	0	0	0	0	0	41	41	0	0	0	0	362	327	0	0	0	0	0	0	0	0	0	0	0
SH:WI:LEWI:16:W	3	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SH:WL:LEWI:16:H	5	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CK:FA:NA:15:H	524	9	0	0	1	0	0	0	0	0	0	0	0	0	22	19	2	222	261	6	0	0	0	0	0	0	0	0	0	0

MARKS RECOVERED			ESTIMATED EGGS TAKEN
M	F	J	
0	0	0	0
66	27	26	0
25	3	42	0
0	0	0	0
0	0	0	0
0	0	0	0
1	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

Egg Take and Incubation

2015 Brood Goldendale Rainbow

Merwin Hatchery received 75,000 eyed eggs from Goldendale Hatchery on December 2, 2015.

2016 Brood Lewis River Summer Steelhead

The first eggs were taken on November 23, 2015. Disposition of this stock to date is as follows:

Total Egg Take	426,739
Egg Loss (27.3%)	116,635
Eggs Destroyed	0
Shipped	0
Fecundity	4,225

2016 Brood Lewis River Winter Steelhead

The first eggs were taken on December 28, 2015. All of these eggs are incubating and none of the egg takes have been shocked or picked. Disposition of this stock to date is as follows:

Total Egg Take	147,600
Egg Loss	0
Eggs Destroyed	0
Fecundity	4,100

2015 Brood Lewis River Wild Winter Steelhead

These fish were spawned from March 26th-May 22, 2015. Disposition is as follows:

Total Egg Take	97,265
Egg Loss (6.42%)	6,243
Eggs Destroyed	0
Fecundity	3,891

REARING PROGRAM

2014 Brood Lewis River Summer Steelhead

The rearing of this brood went very well this year and all program goals were achieved. Steelheads transferred to other facilities this year are as follows: 58,613 summer steelhead juveniles to Echo Net Pens. Hatchery staff released the remaining fish on hand in April 2015. All of these fish were trucked and planted at river mile 5 on the North Fork of the Lewis River.

Final Stock Inventory

Fish Ponded	260,078
Pounds Ponded	104
Pounds @ release (Includes Echo NP)	42,189
Rearing Mortality (7.6%)	19,849
Destroyed	0
Transferred	0
Shortage	0
Feed Fed (lbs) (Includes Echo NP)	40,149
Net Gain (lbs) (Includes Echo NP)	42,085
Conversion	.95:1
Planted	176,498

2014 Brood Lewis River Winter Steelhead

The rearing of this brood went very well this year and all programs goals were achieved. Hatchery staff released the fish on hand in April 2015. All of these fish were trucked and planted at river mile 5 on the North Fork of the Lewis River.

Final Stock Inventory

Fish Ponded	119,135
Pounds Ponded	48
Pounds @ Release	18,432
Rearing Mortality (6.2%)	7,404
Destroyed	18,036
Transferred	0
Shortage	0
Feed Fed (lbs)	16,735
Net Gain (lbs)	18,384
Conversion	.91:1
Planted	110,592

2014 Brood Lewis River Wild Winter Steelhead

The rearing of this brood went extremely well and all program goals were achieved. Hatchery staff released these fish in May 2015. All of these fish were planted at the Merwin Boat Launch on the North Fork of the Lewis River.

Final Stock Inventory

Fish Ponded	82,492
Pounds Ponded	33
Pounds @ Release	8,269
Rearing Mortality (22.5%)	9,471
Planted as unfed fry	9,092
Transferred	0
Shortage	0
Feed Fed (lbs)	6,401
Net Gain (lbs)	8,236
Conversion	.78:1
Planted	70,805

2015 Brood Lewis River Summer Steelhead

The overall rearing of this brood has gone really well and program goals will be achieved. During this rearing cycle these fish were diagnosed with bacterial cold water disease, ichthyopthirius, and furunculosis. They were treated accordingly with higher than average mortality rates. Currently at Merwin Hatchery there are 50,349 juveniles which will go to Echo Net Pens in March 2016. Hatchery staff will start the release of the remaining fish on hand in April 2016.

Stock Inventory this period

Fish Ponded	269,308
Pounds Ponded	108
Fish on hand	225,884
Pounds on hand	26,575
Rearing Mortality (14.4%)	38,688
Destroyed	0
Eggs Transferred	0
Fish Transferred	0
Feed Fed (lbs)	24,455
Net Gain (lbs)	26,467
Conversion	0.92:1

2015 Brood Lewis River Winter Steelhead

The overall rearing of this brood has gone really well and program goals will be achieved. During this rearing cycle these fish were diagnosed with ichthyopthirius and treated accordingly with no serious loss. 9,972 juveniles were hauled to Beaver Creek Hatchery. Hatchery staff will start the release of the fish on hand in April 2016.

Stock Inventory this period

Fish Ponded	118,133
Pounds Ponded	47
Rearing Mortality (4.3%)	5,037
Destroyed	38,031
Fish Transferred	9,972
Fish on Hand	104,798
Pounds on Hand	12,476
Feed Fed (lbs)	11,989
Net Gain (lbs)	12,429
Conversion	.96:1

2015 Brood Lewis River Wild Winter Steelhead

The overall rearing of this brood has gone really well and program goals will be achieved. After genetic assessment, one female spawned this quarter did not meet the genetic criteria for program. As a result 4,400 unfed fry were planted at the Merwin Boat launch on the North Fork of the Lewis. During this rearing cycle these fish were diagnosed with ichthyopthirius, bacterial cold water disease, and furunculosis and treated accordingly with higher than average loss. Hatchery staff will start the release of the fish on hand in May 2016.

Stock Inventory this period

Fish Ponded	84,337
Pounds Ponded	34
Rearing Mortality (26.6%)	22,436
Unfed Fry Plant	4,400
Fish Transferred	0
Fish on Hand	63,676
Pounds on Hand	3,538
Feed Fed (lbs)	2,501
Net Gain (lbs)	3,504
Conversion	.71:1

2016 Brood Lewis River Summer Steelhead

Spawning operations were completed in five egg-takes and went well this period. All takes are still in the incubators with the last take yet to hatch. All takes have been picked and egg loss is higher than average. Currently there are a combination of 310,104 alevin and eggs on hand.

2016 Brood Lewis River Winter Steelhead

Spawning operations were completed in two egg-takes and went excellent this period. Currently, there are 147,600 eggs on hand; these eggs have not been picked yet.

2015 Brood Goldendale Rainbow

We received 75,000 eyed eggs from Goldendale Hatchery in December 2015. These fish will be ponded to IR#6.

Stock Inventory this period

Fish Ponded	0
Pounds Ponded	0
Rearing Mortality	0
Shortage	0
Fish on Hand	Approx. 75K

2014 Brood Goldendale Rainbow

The rearing of this stock has gone really well. During this rearing cycle these fish were diagnosed with ichthyopthirius and furunculosis and treated accordingly with no serious loss. A total of 51,113fish were transferred to Speelyai Hatchery in November 2015. The fish on hand will be used for the Merwin Park Fishing Derby in June 2016 and the Merwin Special Kids Derby (MSKD) in July 2016. Also, 2000 fish will be held over for the 2017 MSKD.

Stock Inventory this period

Beginning balance	74,417
Rearing Mortality (17.2%)	12,775
Shortage	0
Pounds Ponded	25
Fish Planted	0
Fish Transferred	51,113
Pounds Transferred	3,651
Fish on Hand (Derby fish 2016/2017)	5,223
Feed Fed (lbs.)	3,586
Net Gain (lbs.)	3,626
Conversion	.99:1

2015 Merwin Special Kids Derby and Forest Service Derby

For the purpose of this report, we have listed all these fish under one section. Twenty one 2012 Brood Goldendale Rainbow were planted into Merwin Reservoir for the Forest Service Derby in June. The remaining 2012 brood were caught at the derby, planted into Merwin Reservoir, or Swift Power Canal following the derby. The disposition of the 2012 brood is as follows: 539 planted into Merwin Reservoir, 100 planted into Swift Power Canal, and 441 caught at the derby. The disposition of the 2013 brood is as follows: 1,559 planted in Merwin Reservoir for Forest Service Derby, 1,664 planted in Merwin Reservoir for MSKD derby, 100 planted into Swift Power Canal, and 200 caught at the derby. 2,088 were kept for the 2016 MSKD derby.

Stock Inventory This Period 2012 Derby Goldendale Rainbow

Beginning Balance	2,031
Rearing Mortality (9.8%)	199
Fish Caught 2015 Derby	441
Planted	639
Shortage	0
On Hand (Derby fish 2016)	0

Stock Inventory This Period 2013 Derby Goldendale Rainbow

Beginning Balance	5,000
Rearing Mortality (7.5%)	373
Fish Caught 2015 Derby	200
Planted	3,323
Shortage	0
On Hand (Derby fish 2016)	1,754

RAINFALL REPORT

Rainfall is recorded from 8:00 a.m. to 8:00 a.m. day prior

HATCHERY: MERWIN HATCHERY **YR:** 2015 **WATER SOURCE:** MERWIN

YEAR TOTAL: 91.36 INCHES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0.4	0	0.25	0	0.4	0	0	0.25	0	0.85	0.8
2	0	0.5	0.2	0	0	0.35	0	0	0.15	0	0.1	0.6
3	0.7	0.25	0	0.25	0	0	0	0	0.1	0	0	0.8
4	4.5	0.3	0	0	0	0	0	0	0	0	0.01	0.5
5	0.2	1.7	0	0.2	0.25	0	0	0	0.1	0	0.6	1.3
6	0	1.2	0	0	0	0	0	0	0.25	0.4	0.01	2.3
7	0	1	0	0	0	0	0	0	0	0	1.35	1.3
8	0	0.3	0	0.1	0	0	0	0	0	0	0.25	0.97
9	0	2.3	0	0	0	0	0	0	0	0	0	1.25
10	0.1	0	0.15	0.45	0	0	0	0	0	0.65	0	1
11	0.3	0	0.3	0.4	1	0	0	0	0	0	0	0.8
12	0	0	0	0	0.7	0	0	0	0	0	1.9	1.7
13	0	0	0.9	0.7	0.1	0	0	0	0	0	1.4	0.9
14	0	0	2.4	0.4	0	0	0	0.2	0.2	0	0.8	0.25
15	0.5	0	0.4	0	0	0	0	0	0.05	0	0.15	0.8
16	0.15	0	0	0	0	0	0	0	0.25	0.1	4.2	0.75
17	2.3	0	0.1	0	0	0	0	0	0.3	0.1	1.7	2.3
18	0.3	0	0	0	0.35	0	0	0	0	1.15	0.75	0.35
19	0	0	0	0	0	0	0	0	0	0.1	0.1	0.6
20	0	0	0.5	0	0	0	0	0	0	0	0	1.3
21	0	0	0.1	0	0	0	0	0	0	0	0	0.5
22	0	0	0	0	0	0	0	0	0	0	0.9	1.2
23	0.45	0	1.3	0.45	0	0	0	0	0	0	0.1	1.7
24	0.1	0.02	0.6	0.45	0	0	0	0	0	0	0	0.4
25	0	0.6	0.25	0	0	0	0	0	0.15	1.2	0	0
26	0	0.95	0	0.15	0	0	0.4	0	0	0	0	0
27	0.2	0.1	0	0	0	0	0.1	0	0	0.2	0	0.45
28	0	0	0.2	0.1	0	0	0	0.7	0	0.7	0	0.1
29	0		0	0	0	0	0	0.9	0	0.9	0	0.1
30	0		0.1	0	0	0	0	0.6	0	3.6	0.1	0
31	0.3		0.2		0.2		0	0		2.6		0
Total	**10.1**	**9.62**	**7.7**	**3.9**	**2.6**	**0.75**	**0.5**	**2.4**	**1.8**	**11.7**	**15.27**	**25.02**

TOTAL RAINFALL 91.36

*** SNOW**

YEARLY TEMPERATURE REPORT

HATCHERY MERWIN HATCHERY **YEAR:** 2015 **WATER SOURCE:** N.F. LEWIS RIVER

MERWIN RESERVOIR

	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	44	44	44	43	44	44	47	46	48	47	53	52	59	56	61	59	62	61	64	63	62	62	52	51
2	44	44	44	44	44	44	47	46	49	47	53	52	59	56	61	59	62	61	63	63	62	61	52	51
3	44	44	44	44	44	44	47	46	49	48	53	52	60	56	61	59	62	61	64	63	62	61	52	51
4	44	44	44	44	44	44	47	46	49	48	54	51	60	56	62	59	62	61	64	63	61	61	51	50
5	45	44	44	44	44	44	47	46	49	47	54	51	59	56	62	59	63	61	64	63	61	61	51	50
6	45	44	44	44	45	44	47	46	49	48	53	51	59	57	62	59	62	61	64	62	61	61	51	50
7	44	44	44	44	45	44	47	46	49	48	55	52	59	56	61	59	62	61	64	63	61	61	51	49
8	45	44	44	44	44	44	47	46	50	48	55	52	59	57	62	60	62	61	64	63	61	61	49	48
9	44	44	45	44	44	44	47	47	50	48	56	52	59	57	62	60	62	61	64	64	61	60	49	47
10	44	44	45	44	45	44	47	47	50	48	56	52	59	57	61	60	62	61	64	63	60	60	48	47
11	44	44	45	44	45	44	47	46	51	48	56	52	59	58	61	60	62	61	64	63	60	60	48	47
12	44	44	45	43	45	44	48	46	49	49	55	52	60	58	61	60	64	61	64	62	60	59	48	47
13	44	43	44	43	45	44	47	46	49	48	56	52	60	57	61	60	62	61	64	62	60	60	47	47
14	44	43	44	43	45	44	47	47	49	49	55	53	60	57	62	60	63	61	64	63	59	59	47	47
15	44	43	45	43	46	44	48	47	51	48	55	53	61	57	61	60	63	62	64	63	59	58	47	46
16	44	43	45	43	46	44	48	47	52	49	56	53	61	58	61	60	63	62	65	63	58	57	47	46
17	44	43	46	44	45	44	47	47	49	49	56	53	61	57	61	60	63	62	64	63	57	56	47	46
18	44	43	45	44	44	44	48	47	50	49	55	54	60	58	62	60	62	62	64	64	56	55	47	46
19	44	43	45	44	46	44	48	47	51	49	56	54	60	58	62	60	62	62	64	63	56	55	46	46
20	44	43	44	44	45	44	47	47	51	49	56	54	61	58	63	60	63	62	64	63	56	54	46	46
21	43	43	44	44	45	44	47	47	51	49	56	54	60	58	62	60	63	62	64	63	56	55	46	46
22	44	43	44	44	45	44	48	47	51	49	57	55	60	58	62	60	64	62	64	63	55	54	46	46
23	44	43	44	44	45	44	48	47	52	49	56	55	60	58	62	60	63	62	64	63	54	54	45	45
24	44	44	44	44	45	44	48	47	51	50	56	55	60	58	62	60	63	62	64	63	54	53	46	45
25	44	43	45	44	46	45	48	47	52	50	57	55	61	58	62	60	63	62	64	63	53	53	45	45
26	44	43	44	44	46	45	49	47	53	49	57	55	60	59	62	60	64	62	63	63	53	52	45	44
27	44	43	44	44	46	45	49	47	52	50	58	56	60	59	62	60	64	62	63	63	52	52	45	44
28	44	43	44	44	46	45	49	48	52	50	57	56	60	58	62	60	64	62	63	63	52	52	45	45
29	43	43			46	45	49	48	52	51	57	56	61	59	62	61	64	62	63	63	52	52	45	44
30	43	43			46	46	49	48	53	51	58	56	61	59	62	61	64	62	63	62	52	52	44	44
31	43	43			46	46			52	50			61	59					62	62			44	44
AVG	43.96774	43.41935	44.39286	43.78571	45.06452	44.29032	47.63333	46.73333	50.48387	48.77419	55.56667	53.33333	59.96774	57.51613	61.66667	59.83333	62.8	61.53333	63.77419	62.90323	57.53333	57.03333	47.48387	46.7741935
MIN	43	43	44	43	44	44	47	46	48	47	53	51	59	56	61	59	62	61	62	62	52	52	44	44
MAX	45	44	46	44	46	46	49	48	53	51	58	56	61	59	63	61	64	62	65	64	62	62	52	51

DISEASES AND TREATMENTS

DATE:	1/1/15 - 12/31/15	HATCHERY:	MERWIN HATCHERY

DATE	BROOD YEAR/ SPECIES	POND NUMBERS	TREATMENT CHEMICAL	DISEASE
January-July	2016 Summer, Winter & Wild Winter Steelhead	(Eggs) Incubators	Formalin	Fungus
June-Dec.	2016 Summer Steelhead Brood	SP 1 & 2	Formalin	Fungus
March, April	2015 Summer Steelhead	IR's 3, 4, & 5	Aquflor	Bacterial Cold Water Disease
July, August	2015 Wild Winter Steelhead	IR's 5, 4, 3, & 2	Aquflor	Bacterial Cold Water Disease
Sept, October	2014 Goldendale Rainbow	RW's 4 & 5	Romet	Furunculosis
Sept, October	2015 Summer Steelhead	RP's 11, 12, & 14	Romet	Furunculosis
Oct, November	2015 Wild Winter Steelhead	RW's 7 & 8	Romet	Furunculosis
Sept.-Oct.	2013 Goldendale Rainbow	RW 9 &10	Formalin	Ichthyopthirius
Sept.-Oct.	2015 Winter Steelhead	RW-1 & RP-13	Formalin	Ichthyopthirius
Sept.-Oct.	2015 Summer Steelhead	RW-2 & RP-11,12, & 14	Formalin	Ichthyopthirius
Sept.-Oct.	2014 Goldendale Rainbow	RW-1	Formalin	Ichthyopthirius
Sept.-Oct.	2015 Wild Winter Steelhead	RW-7 & 8	Formalin	Ichthyopthirius
December	20145 Goldendale Rainbow	(Eggs) Incubators	Formalin	Fungus
December	2016 Summer & Winter Steelhead	(Eggs) Incubators	Formalin	Fungus
December	2016 Winter Steelhead Brood	AP-2	Formalin	Fungus

MAINTENANCE AND CAPITAL PROJECTS

Maintenance

1. Routine maintenance on air compressors in Ozone Plant
2. Tress pruned
3. North side flower beds dug out and replaced with river rock
4. Repaired sink hole, re-sealed all seams and cracks in rearing pond #14
5. Repaired spalling in steps around handrail
6. Septic tanks pumped for hatchery building & residences
7. New bark mulch blown on flower beds
8. Replaced front wheel bearing and rear brakes on Flatbed
9. Replaced rear-end differential for Ford Cargo planting truck

Capital

1. New fish hauling tank for CAT Topkick planting truck purchased
2. New air compressors purchased for fire suppression system
3. New trash pump and hoses purchased
4. Purchased new hedge trimmer
5. Purchased new band saw
6. New metal man door for 3-Bay purchased
7. New rear duel tires purchased for Ford Cargo planting truck
8. New tires purchased for Ford F-250

OPERATIONS PROGRAM

SPEELYAI HATCHERY

FOR

January 1, 2015 to December 31, 2015

Washington Department of FISH and WILDLIFE

WRITTEN AND COMPILED BY:

SPEELYAI HATCHERY STAFF

Introduction

The Speelyai Hatchery is a PacifiCorp owned and funded facility that is operated by the Washington Department of Fish and Wildlife. It has been in operation since 1958.

Speelyai Hatchery is located 21 miles east of Woodland, just off Highway 503. The hatchery is adjacent to Speelyai Creek on the north shore of Lake Merwin.

Program Goals

- 50,000 Rainbow at 2.5fpp stocked in Swift Reservoir.
- 45,000 Kokanee at 8fpp released into Merwin Reservoir.
- 48,000 Kokanee at 6.9fpp released into Merwin Reservoir.
- 1,300,000 Spring Chinook reared to 90fpp for transfer to Lewis River Hatchery.
- 37,000 Spring Chinook reared to 15fpp for Clear Creek acclimation.
- 53,000 Spring Chinook reared to 15fpp for Muddy Creek acclimation.
- 15,000 Spring Chinook reared to 15fpp for Crab Creek acclimation.

Approximately 9,200 gallons of water per minute can be delivered to the hatchery system by gravity flow from Speelyai Creek.

There are approximately 166,450 cubic feet of available rearing space. This space consists of four 17'x3'x3' intermediate troughs, twenty-four 10'x 80'x4' raceways, four 115'x10'x5' raceways, and one large asphalt pond that serves as an adult holding/spawning pond for Spring Chinook and Type S Coho stocks.

Incubation consists of fifty stacks of FAL vertical incubators, two deep troughs, and a shallow trough.

The Speelyai hatchery site also includes two residences, a hatchery building, a two bay storage building, a shop/garage, a domestic pump house, a small storage building, and two chemical storage buildings.

The Speelyai hatchery staff is also responsible for ten 20'x20'x20' net pens located at Speelyai Bay in Merwin Reservoir.

Adult Holding

2015 Lewis River Spring Chinook, Hatchery Origin

The first fish were received on March 27, 2015. Brood stock was trapped at the Merwin Dam Fish Collection Facility and Lewis River trap. Disposition is as follows:

Adults Received	830
Jacks Received	60
Mortality (32.2%)	267
Adults Spawned	498
Non-Viable	0

This was the 1st year of no ELISA testing on this stock. As an alternative PCR (Polymerase Chain Reaction) testing that checks DNA extracts for bacterium in salmonid kidney was used. No results were given from the test instead the data was used to create a reference database, so no fish were identified as BKD low or high and segregated. Also no fish were culled since egg take goals were not met. All mortality was disposed of at the Cowlitz County Landfill. Due to the fact adults were not injected this year, spawned fish were given to the Clark/Skamania Fly Fishers Association for Nutrient Enhancement.

2015 Lewis River Spring Chinook, Wild Origin

The first fish were received on March 27, 2015. Brood stock was trapped at the Merwin Dam Fish Collection Facility and Lewis River trap. Disposition is as follows:

Adults Received	33
Jacks Received	6
Mortality (66.7%)	22
Adults Spawned	11
Non-Viable	0

The off spring of these fish spawned with a hatchery counterpart will be used in upstream reintroduction. All mortality was disposed of at the Cowlitz County Landfill. Due to the fact adults were not injected this year, spawned fish were given to the Clark/Skamania Fly Fishers Association for Nutrient Enhancement.

2015 Lake Merwin Kokanee

Adult collection started September 9, 2015. Fish were collected from the hatchery effluent Kokanee trap and held in raceway 12. All carcasses were disposed of at the Cowlitz County landfill. Disposition is as follows:

Adults Trapped	442
Mortality (0.0%)	0
Returned to Stream	0
Adults Spawned	442
Non-Viable	0

2015 Lewis River Type S Coho

The first fish were received on September 15, 2015. Brood stock was trapped at both the Lewis River and Merwin Fish collection facilities. Mortality was disposed of at the Cowlitz County Landfill. Disposition is as follows:

Adults Received	1,960
Jacks Received	81
Mortality (22.4%)	440
Adults Spawned	1,502
Non-Viable	15
Nutrient Enhancement	1,520
Landfill	440

2015 Lewis River Type N Coho

The first fish were received on October 26, 2015. These fish were collected because of low returning adult numbers around the state. Brood stock was trapped at both the Lewis River and Merwin Fish collection facilities. Mortality was disposed of at the Cowlitz County Landfill. Disposition is as follows:

Adults Received	1,651
Jacks Received	14
Mortality (10.8%)	179
Adults Spawned	1,111
Non-Viable	3
Nutrient Enhancement	1,469
Landfill	179

SPEELYAI HATCHERY ADULT COLLECTION

SPECIES	ESTIMATED TRAPPED / RECEIVED		RETURNED TO STREAM			SHIPPED / PLANTED			MORTALITIES			CARCASS DISTRIBUTION			LETHAL SPAWNED				LIVE SPAWNED			ESTIMATED ON-HAND		MARKS RECOVERED			ESTIMATED EGGS TAKE
	A	J	M	F	J	M	F	J	M	F	J	M	F	J	M	F	NVF	J	M	F	J	A	J	M	F	J	
CK:SP:LEWI:15:H	830	60							110	157	24	65	0	31	243	255	0	5				0	0	69	91	15	874,300
CK:SP:LEWI:15:W	33	6							7	15	5				9	2		1				0	0	N/A	N/A	N/A	40,600
CO:SO:LEWI:15:H	1,960	81							174	266	10	3	0	0	704	798	15	71				0	0	287	341	3	1,594,216
KO:NA:MERL:15:M	442														221	221						0	0	N/A	N/A	N/A	192,000
CO:NO:LEWI:15:H	1,651	14							100	79	8	166	192	1	555	556	3	5				0	0	183	129	2	1,363,583

Egg Take and Incubation

2015 Lewis River Spring Chinook, Hatchery Origin

Egg Inventory and distribution is as follows:

Total Egg Take	835,360
Egg Loss (5.8%)	48,260
Destroyed	0
Shipped	0
Ponded	835,360
Fecundity	3,410

2015 Lewis River Spring Chinook, Mixed Origin

Egg Inventory and distribution is as follows:

Total Egg Take	42,600
Egg Loss (15.5%)	6,600
Destroyed	0
Shipped	0
Ponded	42,600
Fecundity	3,550

2015 Lewis River Type S Coho, Hatchery Origin

Egg Inventory and distribution is as follows:

Total Egg Take	1,692,019
Egg Loss (17.7%)	293,900
Shipped	1,398,119
Fecundity	2,079

1,120,738 eyed eggs and 32,716 green eggs were shipped to Lewis River Hatchery
244,665 eggs were shipped to Washougal Hatchery as eyed eggs.

2015 Lake Merwin Kokanee, Mixed Origin

Egg Inventory and distribution is as follows:

Total Egg Take	188,300
Egg Loss (31.7%)	59,700
Fecundity	855

At the time of this report, the 2015 Kokanee are still in incubation and will be ponded in January 2016.

2015 Lewis River Type N Coho, Hatchery Origin

Egg Inventory and distribution is as follows:

Total Egg Take	1,363,583
Egg Loss (0.0%)	0
Shipped	431,583
Fecundity	2,550

431,583 eggs were shipped to Lewis River Hatchery as green eggs.
At the time of this report there are 932,000 green eggs on hand to be shipped to other hatcheries in the state in January 2016 when eyed.

Rearing Program

2013 Lewis River Spring Chinook, Hatchery Origin

In January 2015, a total of 185,400 fish were shipped to Lewis River at 14.1 fpp to be acclimated and released in February 2015.

2013 Lewis River Spring Chinook, Mixed Origin

In March 2015, 37,022 fish were planted in the Crab Creek acclimation site and 72,644 fish into the Clear Creek acclimation site at 20.0 fpp.

2014 Lewis River Spring Chinook, Hatchery Origin

Tagging and mass marking was completed in April 2015. All fish being reared this season were Elisa tested below low except for approximately 45,000 lows to highs that were integrated into a single Lewis River below low pond when shipped. In May, a total of 1,327,120 fish were shipped to Lewis River Hatchery.

Disposition is as follows:

Stock Inventory

Beginning Balance	1,357,350
Rearing Mortality (3.9%)	53,703
Fish Shipped	1,327,120
Pounds Shipped	14,861
Fish Planted	0
Pounds Planted	0
Beginning Pounds	1,093
Feed Fed (lbs.)	9,204
Net gain (lbs.)	13,768
Conversion	0.67:1
Population Adjustment	23,473

2014 Lewis River Spring Chinook, Mixed Origin

On October 21, 2015 14,739 fish were planted into the Crab Creek acclimation site and 33,261 fish into the Clear Creek acclimation site at 23.3 fpp.

Disposition is as follows:

Stock Inventory

Beginning Balance	54,300
Rearing Mortality (11.6%)	6,300
Fish Shipped	0
Pounds Shipped	0
Fish Planted	48,000
Pounds Planted	2,060
Beginning Pounds	43
Feed Fed (lbs.)	2,311
Net gain (lbs.)	2,017
Conversion	1.14:1
Population Adjustment	0

2015 Lewis River Spring Chinook, Hatchery Origin

A total of 779,800 Chinook were ponded in November and December. Fish on hand are at an average size of 916 fpp. At the time of this report there are still 7,300 fish to be ponded the first week of January. Those fish are included in the disposition below. Mass marking and Double Indexing are scheduled to take place March through May.
Disposition is as follows:

Stock Inventory

Beginning Balance	787,100
Ponding Mortality (3.0%)	23,380
Pounds Ponded	643
Pounds on Hand	966
Feed Fed (lbs.)	213
Net gain (lbs.)	323
Conversion	0.66:1

2015 Lewis River Spring Chinook, Mixed Origin

Fish on hand are at an average size of 983 fpp. Fry will be transferred to the Clear and the Muddy creek acclimation sites in April, 2016.

Disposition is as follows:

Stock Inventory

Beginning Balance	36,000
Ponding Mortality (3.0%)	1,050
Pounds Ponded	31
Pounds on Hand	47
Feed Fed (lbs.)	21
Net gain (lbs.)	16
Conversion	1.31:1

2014 Lake Merwin Kokanee

On July 16, 2015, 43,664 Kokanee at an average size 28.5 fpp were released from the raceways into Speelyai Bay. These Kokanee were released early due to signs of bacterial kidney disease. At the time of this report there are 46,446 fish on hand at an average of 8.34 fpp scheduled to be released from raceways into Speelyai Bay in March 2016.

Disposition is as follows:

Stock Inventory

Beginning Balance	98,850
Rearing Mortality (9.2%)	9,139
Fish Planted	43,664
Pounds Planted	1,532
Beginning Pounds	23
Feed Fed (lbs.)	5,424
Net gain (lbs.)	7,078
Conversion	0.77:1
Population Adjustment	399

2015 Lake Merwin Kokanee

At the time of this report there are 127,600 fish in incubation to be ponded in January 2016.

2014 Lewis River Type N Coho

In July 2015, 304,224 fish at an average 125 fpp were received from Lewis River hatchery due to construction on the downstream intake. On October 6, 2015 a total of 303,430 fish at an average of 36.8 fpp were hauled back to Lewis River after Spring chinook were released and rearing space became available.

Stock Inventory

Fish Received	304,224
Rearing Mortality (0.26%)	794
Fish Planted	0
Pounds Planted	0
Feed Fed (lbs.)	4,232
Net Gain (lbs.)	5,819
Conversion	0.73:1
Population Adjustment	0

2013 Goldendale Rainbow

On May 27, 2015, a total of 51,800 at 2.53 fpp were released into Swift reservoir. This stock was received from Merwin hatchery on October 30, 2014. On January 1, 2015 there were 52,135 fish at 13.60 fpp. Disposition is as follows:

Stock Inventory

Beginning Balance	52,226
Rearing Mortality (0.89%)	466
Beginning Pounds	3,833
Pounds Planted	20,474
Feed Fed (lbs.)	12,452
Net Gain (lbs.)	16,591
Conversion	0.75:1
Population Adjustment	0

2014 Goldendale Rainbow

At the time of this report there are 51,051 fish at an average size of 9.93 fpp. These fish are currently being reared in Pond 13. They are on schedule to be released into Swift reservoir in June 2016.

YE L EM RA RL EF T

HATCHERY: Speelyai YEAR: 2015 WATER SOURCE: Speelyai Creek

DAY	JAN			FEB			MAR			APR			MAY			JUN			JUL			AUG			SEP			OCT			NOV			DEC		
	MAX	MIN	RAIN	MAX	MIN	RAIN	MAX	MIN	RAIN	MAX	MIN	RAIN	MAX	MIN	RAIN	MAX	MIN	RAIN	MAX	MIN	RAIN	MAX	MIN	RAIN	MAX	MIN	RAIN	MAX	MIN	RAIN	MAX	MIN	RAIN	MAX	MIN	RAIN
1	44.4	43.5		47.7	45.3	0.05	48.7	44.8		50.4	48.6	0.36	51.8	48.9		54.5	53.1	0.05	58.5	53.2		58.6	52.5		53.8	52.3		52.7	49.5		54.0	52.3	2.6	47.5	44.6	0.14
2	45.1	43.5		47.7	45.3	0.74	48.9	44.8	0.06	50.0	48.2	0.22	52.3	50.2		53.2	52.0	0.63	59.0	53.2		58.8	52.5		54.3	52.3	0.16	52.9	49.3		53.1	51.6	0.76	48.0	46.8	0.94
3	46.2	44.6		48.7	47.1	0.42	49.5	45.0		50.2	47.5		52.3	50.2		52.0	51.4	0.25	59.2	53.4		58.1	54.5		54.3	50.7	0.14	51.8	49.6	0.11	52.7	50.4	0.08	48.9	46.8	0.52
4	47.1	45.7	0.52	48.6	47.1	0.22	48.9	44.2		48.6	47.3	0.32	52.3	49.8		52.4	51.4		59.0	53.4		55.6	54.3		54.3	50.2		52.2	48.9		51.3	47.1		49.1	48.4	0.88
5	47.5	46.2	5.05	49.3	47.5	0.43	48.6	44.2		50.0	46.9		51.4	50.2	0.08	53.6	51.4		58.8	53.4		55.9	54.5		54	49.6		52.5	48.9		50.0	47.1	0.03	49.3	48.4	0.37
6	48.4	46.8	0.29	48.7	48.0	1.80	49.5	44.6		50.0	46.8	0.19	51.3	49.8	0.24	54.7	51.8		58.8	53.6		55.6	54.0		52.5	50.7	0.49	53.8	50.4		51.1	50.0	0.5	48.9	48.4	1.03
7	48.0	46.0		49.3	48.6	1.24	50.0	45.3		50.2	48.2	0.02	51.1	49.5		55.2	52.3		58.5	53.6		55.6	53.6		52.2	50.5	0.03	53.4	51.3		52.0	49.6		50.2	48.9	2.32
8	46.9	45.7		49.5	48.2	0.87	50.0	45.3		50.2	48.7	0.04	52.0	48.7		55.8	52.9		58.5	53.4		55.9	54.0		54.5	50.9		53.4	51.3		51.3	49.6	1.23	50.4	48.9	1.48
9	47.8	46.4		49.6	48.2	0.39	50.5	45.5		51.3	48.2		53.1	49.5	0.04	55.9	53.2		58.6	53.4		55.6	54.3		55.0	50.5		53.4	51.3		52.0	50.2	0.51	52.0	50.4	5.08
10	47.8	46.4		49.1	48.6	2.52	50.5	45.7		51.3	48.2		52.8	49.8		55.5	52.9		57.9	54.0		55.9	54.5		55.4	51.3		53.4	51.3	0.11	51.1	49.5	0.03	50.4	49.6	0.95
11	47.8	46.4	0.03	49.6	47.7	0.09	50.5	45.9	0.19	50.5	48.2	0.88	51.4	51.3	0.06	55.1	52.7		55.9	53.4		55.0	55.0		55.4	51.3		52.9	51.3	0.53	50.5	49.5	0.49	49.8	49.3	0.95
12	48.4	47.3	0.15	50.0	47.7		49.3	48.4	0.43	50.0	48.4	0.31	51.3	50.4	0.89	54.9	53.1		54.0	52.9		56.1	54.7		56.1	52.0		52.9	50.2		50.7	49.1	0.03	49.5	48.9	0.62
13	48.4	46.2		48.7	46.4		52.0	48.2		50.5	48.3		50.7	50.0	0.39	54.5	52.5		56.7	52.9	0.01	56.3	54.7		56.1	52.0		52.5	50.0		50.2	49.3	1.66	49.1	48.4	1.5
14	47.3	45.7		49.5	46.4	0.03	51.8	48.4	1.11	50.2	48.2	0.52	50.7	49.6	0.13	54.3	51.8		58.3	53.2		56.3	55.0		55.2	50.2		54.1	50.4		51.8	50.2	2.3	48.9	48.4	0.68
15	46.6	45.3		49.8	46.0		50.0	49.3	2.86	51.3	48.7	0.2	52.0	49.5		54.9	52.0		59.0	52.3		55.8	54.5	0.46	52.0	49.6		53.2	50.2		51.8	50.0	0.76	49.1	48.2	0.03
16	47.1	45.3	0.89	48.7	45.9		49.8	47.3	0.38	51.3	48.8		50.9	50.4		55.2	52.7		57.6	52.9		55.8	54.0		52.3	49.5	0.08	53.4	50.2		50.5	49.1	0.17	48.6	47.8	0.62
17	48.6	46.2	0.14	48.9	46.9		51.3	46.8		51.5	48.9		50.9	50.2		55.2	52.0		56.7	52.3		55.2	53.2		53.4	50.9		53.0	50.3	0.04	49.5	48.4	3.62	48.9	47.8	0.65
18	48.7	46.8	2.58	48.9	46.6		50.0	47.8	0.07	52.1	48.9		52.7	50.2		55.2	52.3		57.6	52.0		55.6	53.8		53.4	51.4	0.29	53.0	50.3	0.36	51.4	48.9	3	48.7	47.5	3.14
19	48.7	47.8	0.23	48.7	46.4		51.6	47.1		52.7	48.9		53.1	50.2	0.21	55.8	53.1		58.5	52.5		55.8	54.0		54.1	50.4		53.0	50.3	0.57	50.9	49.5	0.46	49.3	48.4	0.49
20	48.7	45.7	0.05	49.5	48.2	0.04	51.4	47.1		52.6	49.1		52.0	51.3		54.5	52.3		58.6	53.4		56.1	54.0		54.1	50.4		53.0	50.3		50.9	48.4	0.04	49.1	48.2	0.81
21	46.9	45.5		50.2	46.4		50.0	47.5	0.63	53.2	49.3		53.6	50.9		55.2	51.4		58.6	53.4		55.9	54.7		53.8	52.0	0.05	53.0	50.3		49.8	47.8		48.4	47.7	1.46
22	48.0	45.9	0.03	49.3	44.8		50.2	48.3		51.8	48.2	0.02	53.1	51.8	0.53	55.0	52.7		56.7	52.5		55.2	54.0		54.0	50.5		53.0	50.3		48.9	47.8		48.4	47.7	0.82
23	48.4	47.1	0.03	47.8	44.6		50.2	48.4	0.62	48.2	48.0		52.2	51.1		55.4	53.6		55.9	52.3		54.9	53.2		53.2	48.9		53.0	50.3		49.6	47.7		48.7	46.9	0.94
24	48.7	47.8	0.58	48.0	44.6		49.3	48.0	1.49	48.9	47.8	0.58	51.6	50.9		55.4	53.1		56.8	52.2		56.1	52.9		52.9	48.6		52.7	50.5		49.6	47.5	0.83	46.9	46.0	0.81
25	49.6	47.1		48.4	44.8	0.09	49.8	47.8	0.6	49.3	48.2	0.62	51.8	50.9		55.4	53.3		56.5	52.3	0.33	56.1	51.6		53.4	50.2		52.3	50.7		49.3	47.1	0.07	47.5	46.2	0.09
26	49.6	46.4		48.7	47.3	0.45	49.1	48.6	0.36	50.7	48.6		51.6	50.9		57.9	53.1		54.9	52.3	0.09	56.1	51.3		52.7	51.3	0.11	52.0	51.1	1.86	47.1	45.3		47.6	46.4	0.05
27	49.6	46.0	0.07	49.1	47.8	0.90	51.6	48.5		50.4	48.4	0.08	52.0	51.1		59.0	52.7		55.2	52.2		56.1	51.4		53.4	48.6		52.5	49.5		46.6	45.3		47.8	46.9	
28	48.0	46.4	0.11	49.6	46.4	0.05	51.6	48.4	0.31	52.7	50.0		53.6	50.7		56.1	53.4		55.2	52.3		56.1	52.5	0.05	52.3	48.2		52.2	49.5		46.9	46.0		47.7	47.1	0.2
29	49.1	47.7					51.6	48.4		51.6	50.0	0.08	54.4	51.8		55.6	53.1		57.2	51.8		55.0	53.1	0.54	53.4	48.9		52.2	49.5	0.74	46.9	45.5		48.0	47.1	0.02
30	48.4	46.4					51.3	48.9		51.3	49.3	0.05	54.6	52.5					57.9	52.0		54.1	53.1	1.48	53.4	48.9		52.7	51.6	1.62	46.6	44.8		48.0	46.2	0.11
31	47.7	45.3					51.6	48.6	0.24				54.7	52.5					58.5	52.5		54.1	52.3	0.28				53.8	52.3	3.4				46.6	45.5	
Avg / Tot	47.9	46.1	10.75	49.0	46.7	10.33	50.3	47.0	9.35	50.8	48.4	4.49	52.2	50.5	2.57	55.1	52.5	0.93	57.5	52.8	0.43	55.9	53.6	2.81	53.8	50.4	1.35	52.9	50.4	9.34	50.3	48.5	19.17	48.8	47.7	27.7
Acc. Rain	10.75			21.08			30.43			34.92			37.49			38.42			38.85			41.66			43.01			52.35			71.52			99.22		

DISEASES AND TREATMENTS

DATE:	1/1/15 - 12/31/15

HATCHERY:	SPEELYAI HATCHERY

DATE	BROOD YEAR/ SPECIES	POND NUMBERS	TREATMENT CHEMICAL	DISEASE
1/1 - 3/9	2014 Lewis River Spring Chinook	Raceways	Formalin Drip	Costia
1/1 - 10/21	2013 Lewis River Spring Chinook	Raceways	Formalin Drip	Costia
11/1-12/14	2015 Type N Coho Brood	Adult Pond	Peroxide	Fungus
11/25-12/19	2015 Type N Coho Brood	Raceways	Formalin Drip	Fungus
5/6	2014 Kokanee	Raceways	Formalin Drip	Costia
3/30-9/12	2015 Lewis River Spring Chinook Brood	Raceways 25-27	Formalin Drip	Fungus
9/17 - 9/30	2015 Kokanee Brood	Raceway 12	Formalin Drip	Fungus
9/14 - 9/30	2015 Lewis River Type S Coho Brood	Adult Pond	Formalin Drip	Fungus
9/30-10/30	2015 Lewis River Type S Coho Brood	Adult Pond	Peroxide	Fungus
8/28 - 11/11	2015 Spring Chinook	Incubation	Formalin Drip	Fungus
10/15 - 12/8	2015 Type S Coho	Incubation	Formalin Drip	Fungus
10/18 - 12/8	2015 Type N Coho	Incubation	Formalin Drip	Fungus
10/2-12/3	2015 Kokanee	Incubation	Formalin Drip	Fungus
2/1-2/28	2014 Lewis River Spring Chinook	Raceways	Aquaflor	Coldwater Disease

MAINTENANCE AND CAPITAL PROJECTS

Maintenance

1. Replace UV bulbs on domestic water system.
2. Annual preventative maintenance to fork-lift.
3. Annual preventative maintenance to generator.
4. Annual preventative maintenance to three-phase compressor.
5. Annual preventative maintenance to residential HVAC.
6. Continual patching of potholes in entry road.
7. Annual preventative maintenance to tractor.

Capital

1. Replaced old flatbed.
2. Replace valve on pond 13.
3. Rebuild intake structure.
4. Purchase new diaphragm pump for vacuum system.
5. Replace underground air supply line to diaphragm pump.

2015

DATE:2/08/16

STRIBUTION	CK:SP:LEWI:H:15			CO:SO:LEWI:H:15			CO:NO:LEWI:H:15			SH:SU:LEWI:H:16			SH:WI:LEWI:H:16			CK:FA:LEWI:H:15			CK:SP:LEWI:W:15			Total
	Males	Females	Jacks	Males	Females	Jacks	Males	Females	Jacks	Males	Females	Jacks	Males	Females	Jacks	Males	Females	Jacks	Males	Females	Jacks	
AMERICAN CANADIAN	0	0	0	266	329	25	352	475	53	136	116	0	7	6	0	33	29	1	0	0	0	1,828
CAP	0	0	0	0	0	0	0	0	0	183	216	0	0	0	0	0	0	0	0	0	0	399
DUMP	112	157	24	197	279	15	91	70	8	77	120	0	64	62	0	6	4	0	0	0	0	1,286
V Harv	0	0	0	357	21	1,197	2,538	455	2,167	432	655	0	1,063	1,116	0	524	474	11	0	0	0	11,010
est Ser	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nutrient Enhancement	308	255	36	778	887	74	3,019	3,388	60	0	0	0	0	0	0	0	0	0	0	0	0	8,805
Salvation Army	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hone/Ban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schools	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
wlitz Tr	0	0	0	168	68	154	0	0	0	486	670	0	338	368	0	2	2	0	0	0	0	2,256
nook T	0	0	0	0	0	0	0	0	0	34	41	0	0	0	0	6	4	1	0	0	0	86
th Harv	0	0	0	25	29	0	20	0	0	116	212	0	0	0	0	3	1	0	0	0	0	406
kima Tr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County	0	0	0	0	0	0	110	0	137	49	74	0	0	0	0	0	0	0	0	0	0	370
Indian	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
iapum T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	420	412	60	1,791	1,613	1,465	6,130	4,388	2,425	1,513	2,104	0	1,472	1,552	0	574	514	13	0	0	0	26,446

Complex Staff Jan. 2015-Dec. 2015

Complex Manager-	**Aaron Roberts**
FHS4-	**Michael Chamberlain**
FHS4-	**Kevin Young**
FHS3-	**Shawn Collins**
FHS3	**Luke Miller**
FHS3	**Jesse Cody**
FHS2-	**Jay VonBargen**
FHS2-	**Bruce Kincaid Jr. (out on time loss)**
FHS2-	**Angie Stefani**
FHS2-	**Dwayne Fossen**
FHS2-	**Bryan Coyle**
FHS2-	**Kevin Kitchell**
FHS2-	**Jesse Miller**
FHT-	**Doni Grove**
FHT - (Career Seasonal)	**Chris Roe**
MHCC Student-Work Study	**Cody Ristau**
MHCC Student-Work Study	**Tanner Baumgartner**

Executive Summary

Adult returns were adequate on some stocks but low on others. The Early Coho return this year was very low but egg take goals were met. The Late Coho return was good and we were able to meet egg take goals. We were able to plant 3,754 Early Coho and Late Coho into the upper watershed. Our spring Chinook return was very low and we were not able to meet broodstock goals. Summer Steelhead returns were good with 4,622 fish returned and were able to recycle 1,278 adults downstream. Hatchery winter Steelhead were very good this year a return of 2,192. The Late Winter Steelhead was good with 1,223 returned and planted into the upper watershed.

This was the first year of no ELISA testing on this stock. As an alternative PCR (Polymerase Chain Reaction) testing that checks DNA extracts for bacterium in salmonid kidney was used. No results were given from the test instead the data was used to create a reference database, so no fish were identified as BKD low or high and segregated.

This year there was two major construction projects at the facilities. One of the projects was the rebuild of the downstream intake at Lewis River Hatchery and the other was an intake rebuild at Speelyai Hatchery. Both of these project occurred during the same work window but WDFW staff worked hard to develop a plan to minimize the impact on the fish during this time period. Routine annual maintenance on equipment was done at all three facilities. Thanks to our outstanding WDFW staff and the local staff from PacifiCorp, all three stations are looking and operating well.

As we move forward into re-licensing, we will be presented with many new challenges, both with upstream re-introduction and facilities remodeling. Staff here on the Lewis River system is some of the best in the industry, and committed to facing these challenges with both professionalism and dedication. Their efforts are much appreciated.

Mitigation Summary

Stock	Mitigation Target	Actual Production
Spring Chinook	1,250,000@ 8-12 FFP	1,244,910 @ 11.4 FPP
Early Coho	1,100,000@ 16 FFP	1,178,986 @ 16 FPP
Late Coho	900,000@ 16 FFP	969,998 @ 16 FPP
Summer Steelhead	175,000@ 4.8 FFP	176,498 @ 5.8 FPP
Winter Steelhead	100,000@ 4.8 FFP	110,592 @ 5.6 FPP
Wild Winter Steelhead	50,000@ 6-8 FFP	70,805 @ 9.8 FPP
Kokanee	12,500 Pounds	8263 pounds
Rainbow	50,000@ 2.5 FFP	51,800 @ 2.5 FPP
Wild Spring Chinook	100,000 @ 10-25 FFP	48,000 @ 10-25 FPP

APPENDIX J - Response Matrix from review comments received by March 31, 2016.

Appendix J: Response matrix to comments received on the 2015 Hatchery and Supplementation Program Report

Commenter	Comment	Response
1. Pat Frazier, WDFW, General Comment	This is a very large document and we are only provided a 30-day review period. The short review period makes it very difficult for staff to be able to provide a good and thorough review of a document of this size. In the future, WDFW recommends providing some earlier drafts of these documents or presentations to the ACC regarding the results of the various topics covered in this annual report. Presentations to the ACC could be tailored for only those projects that are of concern to ACC, as compared to projects that are of concern to the TCC.	Beginning in early 2017, PacifiCorp will sponsor an annual workshop in which evaluators will present their results for the prior year. This workshop will provide a means to ask questions related to sampling design, results, analysis and assumptions.
2. Pat Frazier, WDFW, General Comment	For the majority of the monitoring projects the sampling designs and data collection and analysis methodologies are not adequate to meet NOAA guidance. Our overall comment for monitoring activities is that they need to meet NOAA guidelines. To that end WDWF is focusing the majority of our time on providing input to the M&E and H&S Plan updates so that future monitoring activities will achieve NOAA guidance.	The ability to meet VSP guidelines is challenging for many M&E programs on the North Fork Lewis River. In 2015, we added a second fish trap to the lower Lewis River to improve juvenile collection. In addition, increased effort was directed to redd surveys for steelhead to avoid AUC assumptions. VSP precision guidelines have also not been met for upper river surveys during the last 3 years that WDFW has been conducting these surveys due to the lack of observations. Nonetheless, PacifiCorp remains committed to working with the H&S subgroup to develop practical methodologies to improve confidence in abundance estimates. The 2016 planning document will focus on developing new methodologies.
3. Pat Frazier, WDFW, General Comment	The H&S Program 2015 Report as a whole is a relatively brief summary of results. It is lacking a clear description of how each activity and the results links back to the H&S plan and AOP objectives and criteria	See response to comment No. 5

4. Pat Frazier, WDFW, General Comment	The majority of objectives listed in the H&S plan and AOP have not been reported on in this report. For objectives that do have results, it is difficult to determine if the goals of each H&S objective were achieved.	The annual report includes all data collected on an annual basis pursuant to implementation of the Hatchery and Supplementation plan. Some objectives do not have deliverables as part of the H&S plan and others (e.g., Ne for steelhead) have not been implemented yet. See response to comment No. 5
5. Pat Frazier, WDFW, General Comment (Section 3.0)	Section 3.0 on Monitoring & Evaluation would be greatly improved by re-structuring the format into that of a scientific report including a clear description of the purpose, methods (both field and analytical), and results along with a discussion of how the results meet the objectives and criteria outlined in the AOP. Recommendations could then be presented for each activity on how methods could be improved or on how the results can be used to adaptively manage future work.	Agreed. While some objectives have not been met due to delays in approvals (e.g., HGMP approval by NOAA) there are some that have not been fully evaluated through the H&S subgroup. However, all objectives with study plans are addressed in the 2015 report. The current AOP is being updated by the H&S subgroup to include study plans for each objective. Additionally, the M&E portion of the report will be reformatted by objective rather than by species. However, the primary purpose of the report is to present results and analysis; therefore, methods for data collection and analysis will continue to reside in the annual planning document (AOP).
6. Pat Frazier, WDFW, General Comment (finalizing the AOP)	The list of attachments provided for review with the *Lewis River 2015 Annual Summary of License Implementation and Compliance - Aquatic and Terrestrial Resources*, does not appear to include a finalized 2015 H&S AOP. If the purpose of the H&S AOP is to provide the details needed for full implementation of the H&S plan, the AOP should be finalized prior to the issuance of this report and either included as an appendix describing the field and analytical protocols used to achieve results, or cross-referenced within the report.	The concept of a working draft for the annual plan was a recommendation by WDFW (Eric Kinne) during annual planning meetings in 2013. The rationale of this recommendation was to allow for in season changes. However, PacifiCorp agrees with this comment and will revert to final versions of the plan to be completed prior to the start of the program each year. For 2016, our intent is to have a final plan by December 2016 for the 2017 field season.

7. Pat Frazier, WDFW, General Comment	We could not find anywhere in the document or list of attachments that clearly summarized and reported on some of the activities outlined and described in the Monitoring and Evaluation plan. For example, the TCC/ACC Annual Report provides no information on Section 9.3 of the Settlement Agreement. NOTE: Fall Chinook and chum salmon monitoring activities and objectives in the lower Lewis River are now part of the Hatchery and Supplementation Plan as part of the updated plan approved by the FERC in January 2015.	Appendix H added to the report. Appendix H provides the 2014-2015 fall Chinook escapement report prepared by WDFW. This report was inadvertently left out of the draft review version. All appendices have been reviewed to ensure consistency within the document including this comment matrix (as appendix J).
8. Pat Frazier, WDFW, General Comment (Section E – Reporting Requirements)	Past versions of the H&S AOP have included a list of reporting requirements in Section E. It appears many of these requirements are not included or addressed in this report. • Adult Collection and spawning • Egg Incubation and Juvenile Rearing /Release • Monitoring and Evaluation • Hatchery Performance Data • Consistency and adherence with HSRG Guidelines • Summary of Hatchery Upgrades for 2015	***General Response***: Every version of the AOP includes Section E – Reporting Requirements. In addition to production numbers included in the report, an additional attachment has been included: Appendix I – WDFW Lewis River Hatchery Complex Operations Program. This attachment provides all adult collection, spawning, egg takes, incubation, pathology and juvenile releases for all H&S species. ***Monitoring and Evaluation:*** The annual report includes all information gathered annually pursuant to implementation of the Hatchery and Supplementation plan. Not all objectives are addressed every year and some evaluations meet more than one objective. Formatting changes proposed for 2016 (see response to No. 5) will make it easier to see how each objective is evaluated as will the cross referenced table added as an objective in the M&E plan ***Hatchery Performance Data:*** This section of the AOP will be revised to reflect that Section 4.3.5 no longer exists with the revised H&S plan. Rather, "Hatchery Performance Standards" are now integrated as objectives. ***Consistency and adherence with HSRG Guidelines:*** Hatchery practices are managed by the WDFW and

		incorporating HSRG guidelines are currently being reviewed by NOAA as part of the Hatchery and Genetic Plan for each stock. Once these plans are approved, additional measures may be incorporated to meet HSRG guidelines. Section 5.0 of the annual report identifies several concerns and recommendations that the H&S subgroup should review and mitigate if necessary. These include, genetic risks from the late winter steelhead supplementation, family representation of late winter steelhead crosses, continued genetic screening, use of circular rearing vessels, and need to improve precision of monitoring estimates. ***Hatchery Upgrades:*** Per Section 8.2.3 of the Settlement Agreement, a list of hatchery upgrades is provided in the annual operating plan including completion dates for each item identified in Schedule 8.7 of the Settlement Agreement. Note: All upgrades have been completed