ANNUAL PROJECT PERFORMANCE REPORT

Lower Snake River Compensation Plan

Oregon Evaluation Studies

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INTRODUCTION

The goals of these studies are: 1) to evaluate the success of achieving Lower Snake River Compensation Plan objectives, 2) develop and recommend hatchery practices for LSRCP hatchery production facilities in Oregon that will meet compensation requirements and management objectives for the production of spring Chinook salmon and summer steelhead lost as a result of construction of the Lower Snake River dams, and 3) provide natural production and life history information to assist in recovery and monitoring of threatened salmonids in northeast Oregon.

We are conducting an ongoing comprehensive evaluation program for LSRCP activities in Oregon that address the following general guidelines:

1. Develop and evaluate operational procedures which will meet recovery and compensation goals as well as management objectives by priority.
2. Monitor operational practices to document hatchery production capabilities and challenges.
3. Monitor fish-rearing activities and results to document accomplishment of goals.
4. Coordinate research and management programs with hatchery capabilities.
5. Recommend hatchery production strategies that are consistent with endangered species recovery efforts.
6. Develop knowledge and information to guide recovery actions and to monitor recovery in the Grande Ronde and Imnaha river basins.

A long-term evaluation and monitoring process is envisioned for the duration of operation of the hatcheries to develop and maintain fish runs that meet recovery and compensation goals at minimum costs.

This document is a contract performance report for the period 1 October 2014- 30 September 2015. This is not an Annual Progress Report, rather it is a brief report on statement of work task specific accomplishments.

PRODUCTION MONITORING

Objective 1. Assist with spring Chinook Salmon and summer steelhead broodstock management.

Task 1.1. Provide pre-season and in-season run strength and run composition predictions for Chinook Salmon and steelhead for development of broodstock collection and fishery plans.

This task was completed. We provided escapement predictions and run composition to LSRCP facilities that are presented in the 2015 Annual Operations Plan for Chinook salmon (Tables 8-12) and steelhead (Table 3). These estimates were used to set broodstock collection plans and fisheries for the coming year.

Objective 2. Document broodstock collection and fish culture and hatchery operation practices at each Lower Snake River Compensation Plan facility in Oregon.

Subobjective 2.1. Document spawning activities at all LSRCP facilities.

Task 2.1.1. Document run timing, spawn timing, pass/keep scenarios and spawning matrices for spring Chinook Salmon returning to Lookingglass Fish Hatchery (Lookingglass Creek) and the Imnaha River, Catherine Creek, Upper Grande Ronde River and Lostine River.

This task was completed. Pass/keep scenarios were set, based on sliding scales if established, prior to the run (at the Annual Operating Plan meeting) and altered, as necessary, as the run developed, based on in-season PIT tag data. Hatchery Production and/or Research personnel from ODFW (Lookingglass Hatchery and Imnaha River), CTUIR (Catherine Creek and upper Grande Ronde River), and NPT (Lostine River) recorded data from all Chinook salmon adults captured at weirs to document pass/keep scenarios and run timing of hatchery and natural Chinook. Hatchery spawning matrices were documented by ODFW Research and Lookingglass Hatchery personnel. Data collected on spawning ground surveys, by all co-management agencies, were used to document spawn timing of hatchery and natural Chinook. These data were compiled by ODFW Research for reporting to LSRCP.

Task 2.1.2. Document run timing, spawning timing, pass/keep scenarios, and spawning matrices for summer steelhead returning to Wallowa Fish Hatchery, the Big Canyon Facility and Little Sheep Creek Facility.

This task was completed. Projected steelhead spawn timing, pass/keep scenarios, and spawning matrices for brood year 2015 are in the 2015 Annual Operations Plan. Actual run timing, spawn timing, pass/keep scenarios, and spawning matrices for run year 2013 were published in the 2013 Annual Progress Report (completed September 2015). These

metrics were also recorded for adults returning in 2015.

Task 2.1.3. Document number, size, sex and marks for all spring Chinook Salmon and summer steelhead broodstock spawned in northeast Oregon.

This task was completed. ODFW Research personnel were on site to collect and record these data from all Chinook salmon spawned at Lookingglass Hatchery. These data have been incorporated into our Chinook salmon database and will be reported to LSRCP. Characteristics (number, length, sex, marks) of adult steelhead returns to LSRCP facilities in Oregon are presented in Figures 1 and 2, and Table 8 of the 2013 Annual Progress Report. These metrics were recoded for adult returns in 2015.

Task 2.1.4. Measure fecundity (including retained eggs) and egg size (weight) for spring Chinook Salmon females spawned in northeast Oregon.

This task was completed. ODFW Research personnel were on site to collect and record these data from all Chinook salmon spawned at Lookingglass Hatchery. Fecundity was determined using an egg counter and mean egg weight was estimated by individually weighing 20 eyed eggs from each female. These data have been incorporated into our Chinook salmon database and will be reported to LSRCP.

Task 2.1.5. Collect genetic samples from Imnaha and Wallowa stock summer steelhead and Chinook Salmon spawned in northeast Oregon.

This task was completed. ODFW Research personnel collected genetic samples (opercle punches) from all Chinook salmon spawned at Lookingglass Hatchery.

Steelhead genetic samples were collected as follows: 1. Tissue samples from 50 each of Wallowa and Imnaha stock hatchery juveniles were collected and sent to Ewann Berntson (NOAA Fisheries) for Genetic Stock Identification, 2. Samples from approximately 500 natural-origin juveniles were collected from Little Sheep Creek and sent to NOAA Fisheries for a Relative Reproductive Success study, 3. Samples from 260 mixed origin Little Sheep stock adults went to NOAA Fisheries or Matt Campbell (IDFG), and 484 Wallowa Hatchery stock adult samples went to IDFG for the parental based tagging project.

Task 2.1.6. Record disposition of all broodstock collected, including spawned, killed-not-spawned (landfill, food bank, tribal ceremonial and subsistence or donated for educational purposes), passed or outplanted.

This task was completed. ODFW Research personnel were on site to collect and record these data from all Chinook salmon spawned at Lookingglass Hatchery. These data have been incorporated into our

Chinook salmon database and will be reported to LSRCP. The disposition of adult steelhead collected at LSRCP facilities in Oregon is presented in Table 8 of the 2013 Annual Progress Report published in September 2015. The disposition of steelhead returning to facilities in 2015 was recorded and will be reported in the 2015 Annual Progress Report.

Task 2.1.7. Collect snouts from coded-wire tagged fish and scales from untagged fish for ageing steelhead and spring Chinook Salmon spawned at LSRCP facilities in Northeast Oregon.

This task was completed. ODFW Research personnel were on site to collect snouts and scales and to record associated data from all Chinook salmon spawned at Lookingglass Hatchery and all steelhead spawned at Wallowa Hatchery and the Little Sheep Creek weir.

Subobjective 2.2. Document juvenile rearing and release activities at all LSRCP facilities.

Task 2.2.1. Calculate fertility rates for spring Chinook Salmon and egg-to-fry and fry-to-smolt survival rates for each stock of summer steelhead and spring Chinook Salmon. Collect individual fecundity (green eggs) and number of eyed eggs for determination of fertilization rate (percent of green eggs reaching the eyed stage) for spring Chinook Salmon. Document number of fry ponded, number of parr coded-wire tagged and number of mortalities to estimate number of smolts released for spring Chinook Salmon and summer steelhead.

This task was completed. ODFW Lookingglass Hatchery personnel used an electronic egg counter to enumerate live and dead eggs at the time of eye-up for Chinook salmon. They also documented mortalities at all life stages to determine the numbers of fry ponded and smolts released. A census of the fish on hand was also made at the time of coded-wire tagging. These data were compiled by ODFW Research personnel to calculate fertilization rates and egg-to-fry and fry-to-smolt survival rates. These data will be compiled and reported to LSRCP.

Information pertaining to steelhead egg collection at LSRCP facilities in Oregon and associated life-stage survival rates are reported in Tables 1 and 11 of the 2013 Annual Progress Report published in September of 2015. This information was also collected in 2015 for reporting in the 2015 Annual Progress Report.

Task 2.2.2. Document numbers, size, time of release, and release location for all LSRCP-produced summer steelhead and spring Chinook Salmon.

This task was completed. Numbers of Chinook salmon smolts released were determined by subtracting the numbers of mortalities following coded-wire tagging from the census taken during tagging. Mean length, weight, and condition factor were determined from a pre-release sample

conducted by ODFW, CTUIR, and NPT Research staffs approximately one month prior to smolt release. Date of transfer to acclimation sites, dates of release, and release location were documented by Hatchery Production and Fish Transport staff from the co-management agencies. These data were entered into the ODFW Hatchery Management Information System database and will be compiled for submission to LSRCP.

Juvenile steelhead release numbers, size, time of release, and release location at LSRCP facilities are reported in Table 3 of the 2013 Annual Progress Report published in September of 2015. This information was also collected in 2015 for reporting in the 2015 Annual Progress Report.

Task 2.2.3. Conduct periodic monitoring for Chinook Salmon size (eggs and fish) during incubation and rearing. Weigh 20 individual eggs from each female at the eyed stage to compare among origins (natural, captive broodstock, or conventional broodstock) and ages (4 and 5) of females. Collect individual length and weight measurements from a sample of juveniles during CWT tagging and prior to release.

This task was completed. All eggs (BY 2015; FY 2016) were weighed in 2013. Individual lengths (BY 2014; FY 2015) were collected from 250 fish and weights (and condition factor calculated) from 50 fish in each pond at the time of coded-wire tagging and at pre-release sampling.

Task 2.2.4. Conduct pre-release sampling of length, weight and condition factor for summer steelhead from acclimation ponds or hatchery raceways.

This task was completed. Pre-release sampling from brood year 2012 is reported in Table 3 of the 2013 Annual Progress Report published in September of 2015.

Task 2.2.5. Estimate sex ratios of summer steelhead remaining in acclimation ponds after volitional release periods to determine if they will be forced out or be outplanted to reduce the abundance of residual hatchery fish.

This task was completed at Big Canyon and Little Sheep Acclimation sites in 2015. At Little Sheep 55% of fish remaining after volitional release were males and at Big Canyon 65% were males. Because < 70% were males, all remaining fish from both facilities were forced released into the stream.

Task 2.2.6. Participate in planning processes for ponding and rearing of all steelhead and Chinook Salmon.

This task was completed. ODFW Research personnel participated in the discussions of ponding and rearing held at the 2015 Annual Operating

Plan meetings held in December 2014.

Task 2.2.7. Collect tissue samples for genetic analyses from all Chinook Salmon and steelhead spawned in Lookingglass and Wallowa fish hatcheries.

This task was completed. Genetic samples were collected from Chinook salmon handled at weirs and spawned at Lookingglass Hatchery by ODFW, CTUIR, and NPT Hatchery Production and Research personnel. See task 2.1.5 for a description of steelhead activities.

Task 2.2.8. Prepare and submit tag, mark and release reports.

This task was completed. Tag, mark and release reports were prepared and submitted to the ODFW Fish Propagation Section. Coded-wire tag release files were submitted to ODFW's HMIS database, then transferred to RMIS. PIT tag release files were submitted directly to PTAGIS.

Task 2.2.9. Summarize and evaluate the results of Tasks 2.2.1-2.2.4.

This task was completed. Results from Tasks 2.2.1-2.2.4 are submitted to LSRCP and reported in Annual Progress Reports. Steelhead data summarization and evaluation for Tasks 2.2.1-2.2.4 are included in the 2013 Annual Progress Report completed in September 2015.

DISEASE MONITORING, PREVENTION, AND TREATMENT

Objective 3. Document and monitor bacterial kidney disease (BKD) status of hatchery-reared spring Chinook Salmon released from LSRCP facilities, natural smolts and hatchery-reared and natural adults returning to supplemented (Upper Grande Ronde River, Catherine Creek, Lostine River, Lookingglass Creek and Imnaha River) and unsupplemented (Minam and Wenaha rivers) Grande Ronde and Imnaha basin streams.

Approach: Routine disease monitoring, prevention, and treatment activities are included in the LSRCP Oregon Hatchery O&M Project. ODFW Fish Health monitors BKD status of juveniles reared at Lookingglass Fish Hatchery and adults spawned in captivity. ODFW Fish Research collects kidney samples for BKD analyses from spring Chinook Salmon during field activities when Fish Health personnel are not present, i.e., screw traps and spawning ground surveys. We collect tissue samples from natural smolts and hatchery-reared and natural adults that returned to supplemented (Upper Grande Ronde River, Catherine Creek, Lostine River, Lookingglass Creek and Imnaha River) and unsupplemented (Minam and Wenaha rivers) Grande Ronde and Imnaha basin streams. Data are entered and stored in Excel spreadsheets and Access databases.

Task 3.1. Collect kidney tissues from hatchery-reared spring Chinook Salmon smolts during pre-release sampling and from hatchery and natural smolts at screw traps (incidental mortalities).

This task was completed. ODFW Fish Health personnel collected kidney tissues from ~40 Chinook salmon smolts from each stock (Catherine Creek, upper Grande Ronde River, Lostine River, Lookingglass Creek and Imnaha River) at Lookingglass Hatchery. Natural Chinook incidental mortalities from screw traps were also provided to ODFW Fish Health Services by ODFW Early life History Program personnel.

Task 3.2. Collect kidney tissues from intact carcasses of natural and hatchery-reared spring Chinook Salmon adults recovered during spawning ground surveys.

This task was completed. Kidney samples were collected from intact (abdominal cavity not exposed to the environment) carcasses recovered on spawning ground surveys. We collected a total of 250 samples and had a target of at least 20 samples from each sampled stream, which we achieved for all streams.

Task 3.3. Deliver samples to ODFW Fish Health Laboratory, La Grande, for determination of BKD status using enzyme-linked immunosorbent assay (ELISA).

This task was completed. Kidney samples collected from spawning ground surveys were delivered to the Fish Health Lab, generally within 24 hours of being collected.

Task 3.4. Compare ELISA optical densities between natural and hatchery-reared salmon and between supplemented and unsupplemented streams. Examine trends in BKD prevalence over time in all sampled populations.

This task was completed. These results are included in Annual Progress Reports written for LSRCP.

OPTIMUM PRODUCTION STRATEGIES

Survival Studies

Objective 4. Determine optimum rearing and release strategies that will produce maximum survival to adulthood for hatchery-produced summer steelhead and spring Chinook Salmon smolts.

Subobjective 4.1. Determine and compare the juvenile outmigration performance of summer steelhead smolts that leave the Little Sheep Creek Facility throughout a volitional release period.

Task 4.1.1. Summarize information on PIT-tagged fish recovered at traps or mainstem dams from fish released from ponds.

This task was completed. Outmigrating juvenile PIT-tag detection files from releases in 2015 have been downloaded from PTAGIS and summarized. Adult PIT-tag recoveries at mainstem dams from juveniles volitionally released from the Little Sheep Creek Facility in 2013 and 2014 have returned in this contract year and have also been downloaded and summarized.

Task 4.1.2. Compare the outmigration performance of PIT-tagged fish that emigrate from the Little Sheep Creek Facility throughout the volitional release period.

This task was completed. PIT-tag recovery data at Lower Granite Dam have been downloaded to compare the outmigration performance of fish that volitionally migrated in the earliest 25% of the release period with those that migrated in the middle 50% and last 25% of the release. This information is in Table 5 of the 2013 Annual Report completed in September 2015.

Task 4.1.3. Sample for residual steelhead abundance in index streams at index areas during summer of 2015.

This task was completed. Residual steelhead sampling at index sites in Deer and Little Sheep creeks was conducted in August 2015.

Subobjective 4.2. Compare stray rates and smolt-to-adult survival of adults that are progeny from autumn-arriving adult broodstock and those of standard production broodstock summer steelhead.

Task 4.2.1. Compare adult migration timing between progeny of early returning (Autumn Line) adults and standard production groups to determine if run timing is heritable.

This task was completed. Adult migration timing for the first eight brood years has been summarized and compared. In the contract period a poster from this work was presented at the American Fisheries Society annual meeting and a manuscript from this study was revised and re-submitted to the North American Journal of Fisheries Management, but it was not accepted.

Task 4.2.2. Compare out-of-basin stray rates between progeny of early returning (Autumn Line) adults and standard production groups to determine if Autumn Line progeny are less likely to stray.

This task has been completed. Coded-wire-tag recovery data has been summarized to compare stray rates between the two groups. Recovery data is complete for the first generation releases and partially complete for

second generation releases. In the contract period a poster from this work was presented at the American Fisheries Society National Meeting and a manuscript from this study was revised and re-submitted to the North American Journal of Fisheries Management, but it was not accepted.

Task 4.2.3. Compare smolt-to-adult survival between progeny of early returning (Autumn Line) adults and standard production groups.

This task has been completed. Smolt-to-adult survival estimates based on PIT-tag recoveries have been summarized and compared for the first eight brood years of releases, whereas coded wire tag derived estimates are available for the first six brood years of releases. A poster with this data was presented at the American Fisheries Society National Meeting in August.

Task 4.2.4 Compare harvest between progeny of early returning (Autumn Line) adults and standard production groups.

This task has been completed. Harvest information has been summarized for the first five brood years of releases. A poster with this data was presented at the American Fisheries Society National Meeting in August.

Subobjective 4.3. Continue study to investigate direct release vs. acclimated release strategies to improve survival in hatchery-produced Chinook Salmon and reduce the cost of the hatchery program. This study began with the 2011 brood year and will last for at least five brood years.

Task 4.3.1. Transfer BY 2013 acclimated group to the Imnaha River Acclimation Site on approximately 24 March 2015. After about 1 week of forced acclimation (approximately 31 March 2015), allow two weeks of volitional release, followed by forced release of all remaining salmon on approximately 11 April 2015.

This task has been completed. We transferred 197,925 Chinook smolts to the Imnaha River Acclimation Facility on 26 March 2015, allowed them to leave volitionally from 1-14 April 2015, when all remaining smolts were forced out.

Task 4.3.2. Transfer BY 2013 direct release group of salmon to the Imnaha River Acclimation site on approximately 31 March (the first day of volitional release for the acclimated group) and release them directly into the Imnaha River.

This task has been completed. We transferred 133,778 Chinook smolts to the Imnaha River Acclimation Facility and released them directly into the Imnaha River on 14 April 2015.

Task 4.3.3 Implant coded-wire tags into each BY 2014 parr in each of four raceways of Imnaha River Chinook Salmon at Lookingglass Hatchery with codes

unique to each raceway. Note: the same two raceways will be used as controls for the Acclimated vs. Direct Release and Growth Modulation studies.

This task has been completed. We tagged ~100% of the smolts in each of two raceways for each treatment. Raceways have not yet been assigned to release treatments but a total of 342,176 parr in four raceways were tagged.

New Proposals for Optimum Production Studies

Subobjective 4.4. Coordinate development of a study to investigate a growth modulation rearing strategy to improve survival and/or shift age composition toward older age at maturation in hatchery-produced Chinook Salmon.

ODFW will continue to work with co-managers and the LSRCP office to develop a coordinated and supported study plan. The general approach will be to rear a control group of salmon under the standard rearing protocol used at Lookingglass Hatchery and an experimental group using a reduced lipid feed and a modified feeding schedule that will increase growth from first feeding feeding until 31 July and reduce growth from 1 August - 31 October. If implemented we will rear two raceways of BY 2014 Imnaha River Chinook Salmon on standard feed and feeding rate in order to attain the growth rates for standard production (control) listed in Table 1. Note: the same two raceways will be used as controls for the Acclimated vs. Direct Release and Growth Modulation studies. We will rear two raceways of BY 2013 Imnaha River Chinook Salmon on a reduced lipid feed and at a reduced feeding rate in order to attain the growth rates listed for low lipid production in Table 1.

Table 1. Feeding schedule and growth targets for standard production and low lipid treatment groups, as well as schedules for data collection for growth modulation study using Imnaha River Chinook Salmon at Lookingglass Hatchery.

	Standard production (control)		Low lipid production		Data to collect		
Month	Days Fed per Week	Target weight (g)	Days Fed per Week	Target weight (g)	Length & weight	Density index	Dry weight
Ponding	7	0.36	7	0.36			
February	7	0.49	7	0.53	X	X	
March	7	0.87	7	0.99	X	X	
April	7	1.90	7	2.25	X	X	
May	7	2.87	7	3.63	X	X	X
June	7	4.54	7	6.10	X	X	
July	7	8.57	7	10.50	X	X	
August	7	11.07	5	11.21	X	X	X
September	7	14.65	5	11.92	X	X	

October	7	16.81	5	12.63	X	X	
November	7	16.81	7	13.35	X	X	X
December	7	17.46	7	13.76	X	X	
January	7	18.92	7	14.19	X	X	
February	7	19.74	7	14.65	X	X	X
March	7	20.64	7	15.13	X	X	

Funds for this study have not been included in the budget. A separate funding proposal will be submitted when co-manager agreement is reached.

This task was not completed. We could not get agreement of the co-managers for this study.

Subobjective 4.5. Begin a reciprocal rearing and release study, starting with BY 2014 releases, to investigate why Wallowa stock steelhead reared and released in ODFW facilities exhibit lower survival to adulthood and higher straying than Wallowa stock that is reared and released by WDFW. A complete study proposal was written, circulated, and agreed to by co-managers during the 2013 and 2014 Hatchery AOP processes. The general approach will be to transport one raceway of smolts reared at Irrigon Hatchery to WDFW's Cottonwood Acclimation Facility for release, and an equal number of smolts reared at WDFW's Lyon's Ferry Hatchery will be transported and released from the Wallowa Hatchery acclimation site. We will PIT tag 4,000 smolts and coded-wire tag 25,000 smolts at Irrigon Hatchery prior to their transfer to Cottonwood Acclimation Facility. An equal number of Lyon's Ferry reared smolts will be PIT tagged either prior to transport to the Wallowa Hatchery or immediately after transport. Lyon's Ferry origin smolts released from the Cottonwood Acclimation Facility will be PIT and coded wire tagged, as will Irrigon origin smolts released from the Wallowa Hatchery Acclimation site. PIT tags will be used to evaluate smolt to adult survival and adult migration timing. Coded-wire tags will be used to evaluate straying.

Task 4.5.1. Coded-wire tag and adipose clip BY 2014 juveniles from each of two raceways at Irrigon Hatchery with codes unique to each raceway. In January, implant PIT tags into all Wallowa stock release groups.

This task was completed as planned.

Task 4.5.2. In early February 2015, transfer one raceway (approx. 40,000 smolts) from Irrigon Hatchery to the Cottonwood Creek Acclimation Pond and the second raceway from Irrigon Hatchery to the Wallowa Hatchery Acclimation Facility. At about the same time, approx. 40,000 smolts will be transferred from Lyon's Ferry Hatchery to the Wallowa Hatchery Acclimation Facility.

This task was completed.

Task 4.5.3. Compare outmigration survival and migration timing of smolts released in 2015 for this study.

This task was completed. Outmigration data was presented informally at the 2015 Annual Operation Plan meeting in November.

Subobjective 4.6. Experimentally evaluate a programmatic change in the date when Wallowa stock steelhead are transported to the Wallowa Hatchery Acclimation Facility. Traditionally, Wallowa stock smolts destined for release in April have been liberated from Irrigon Hatchery to acclimation ponds in the third week of February. Due to uncertain water availability at the hatchery in release year 2013, a decision was made to move a portion of the hatchery production to the Wallowa Hatchery Acclimation Ponds in the first week of February. In 2014, the same water supply concerns prompted all April release groups to be transferred to acclimation in the third week of January. Managers at Irrigon Hatchery foresee continued late winter water supply problems that will force the transport of smolts to acclimation in January. A lengthier acclimation period may affect the post release survival or straying of release groups, though there is little information available to us to predict what that affect might be. Therefore, to understand the benefits or drawbacks of a lengthier acclimation period a study will be conducted from release years 2015 through 2018, whereby one pond of Wallowa stock smolts will be reared at Irrigon Hatchery until the historically normal liberation date of the third week in February, and their post-release performance will be compared to the remainder of the April release groups brought to acclimation in late January.

Task 4.6.1. In brood year 2014 one raceway of smolts that are adipose clipped, uniquely coded-wire-tagged (25,000 tags), and PIT tagged to track juvenile outmigration metrics, will be reared to 4.5 fish per pound and transferred to the Wallowa Hatchery Acclimation Facility in the third week of February. The remainder of the Wallowa stock production destined for release in April will be reared to 5.0 fish per pound and transferred to acclimation in late January.

This task was completed as planned.

Task 4.6.2. Compare outmigration survival and migration timing of smolts released in 2015 for this study.

This task was completed. There was no statistically significant difference in the downstream migration characteristics between groups that went to acclimation in January and those that went in February.

CATCH ACCOUNTING

Marking and Tagging

Objective 5. Mark (adipose clip), PIT tag and coded-wire tag representative groups of hatchery-produced spring Chinook Salmon and steelhead for selective fisheries and comparison of migration patterns and survival differences among hatchery rearing and release groups. PIT tags are also being increasingly used for in-season run projections.

Task 5.1. Coded wire tag 100,000 Autumn Line (50,000 Ad-RV-CWT + 50,000 AD-CWT), 100,000 standard production (25,000 Ad-LV-CWT + 75,000 Ad-CWT), 25,000 late transport to acclimation (AD-CWT), and 25,000 transport to Cottonwood Creek (AD-CWT) summer steelhead progeny of the 2014 brood year to assess experimental and standard programmatic releases at Wallowa Hatchery, Cottonwood Creek, and Big Canyon Acclimation Ponds.

This task was completed as scheduled (see Table 1).

Table 1. Summary of groups of steelhead that were coded-wire tagged and fin-clipped (BY 2015) and PIT tagged (BY 2014) in FY 2015. WAP = Wallowa acclimation ponds at Wallowa Hatchery; BC = Big Canyon facility, LF = Lyon's Ferry Hatchery, CC = Cottonwood Creek Acclimation Pond.

Stock, release group	Acclimation Pond[a]	No. of CWTs	Fin Clip	LSRCP PIT tags	CSS PIT tags	Total PIT tags
Wallowa stock						
WAP, early transfer, April release	U	25,000	Ad	3,200	1,100	4,300
WAP, Autumn Line, early transfer, April release	U	25,000	Ad-RV	3,000	1,400	4,400
WAP, early transfer, April release	L	25,000	Ad-LV			
WAP, late transfer, April release		25,000	Ad			
WAP, Autumn Line, May release	L	25,000	Ad-RV	1,600	800	2,400
WAP, Production, May release				1,700	800	2,500
LF, early transfer, April release						
CC, early transfer, April release	N/A	25,000	Ad	4,000	0	4,000
BC, forced April	U	25,000	Ad	2,000	1,000	3,000
BC, Autumn Line April	U	25,000	Ad	1,100	500	1,600
BC, forced May	L		Ad	1,600	700	2,300
BC, Autumn Line May	L	25,000	Ad	1,600	700	2,300
Subtotal		250,000		19,800	7,000	26,800
Imnaha stock						
Little Sheep, vol. April	27	25,000	Ad	3,000	2,700	5,700
Little Sheep, vol. April	29	–	Ad	3,700	2,700	6,400
Little Sheep, direct April (if agreed)	30	–	Ad	1,300	1,200	2,500
Subtotal		25,000		8,000	6,600	14,600
Grand total		275,000		27,800	14,000	41,800

[a] Refers to either the upper (U) or lower (L) pond at the Wallowa Acclimation Pond (WAP) or Big Canyon (BC) acclimation facilities.

Task 5.2. PIT tag 5,700 Autumn Line (Ad-RV-CWT or Ad-RV or AD only), 8,500 standard production (Ad-LV-CWT or Ad only), 800 late transport to acclimation (AD-CWT or AD-only, 4,000 transport to Cottonwood Creek (AD-CWT or AD-only), and 3,000 (AD-only) Lyon's Ferry reared summer steelhead

progeny of the 2014 brood year (22,000 total) to assess juvenile migration performance and adult return timing from releases at Wallowa Hatchery, Cottonwood Creek, and Big Canyon Acclimation Ponds.

This task was completed (see Table 1). However, 3,000 PIT tags designated for smolts produced at Lyons Ferry Hatchery for the reciprocal experiment were not used because the Lyons Ferry Hatchery Evaluation Project had requested their own 3,000 tags. As per instruction from Steve Yundt, we have the unused PIT tags in our storage area.

Task 5.3. Mark (Ad- CWT) one group of 25,000, 2014 brood Imnaha stock steelhead for release at the Little Sheep Creek Facility for production monitoring. PIT-tag 6,200 steelhead for release at Little Sheep Creek Facility, and 1,800 for direct release in Big Sheep Creek for juvenile migration performance monitoring, and smolt to adult return back to the LSRCP area.

This task was completed. A total of 8,000 Imnaha stock smolts were tagged as planned.

Task 5.4. Mark Adipose clip 100% of the Imnaha River, Lostine River, Catherine Creek and Lookingglass Creek and 50% of the Upper Grande Ronde River spring Chinook Salmon at Lookingglass Fish Hatchery (Table 3). Note: 100% of no adipose clip Grande Ronde River Chinook Salmon will have CWT (see Task 5.5).

This task was completed. We attempted to insert coded-wire tags into and/or clip adipose fins from representative groups of the BY 2013 salmon from each stock (Tables 2 and 3).

Task 5.5. Mark Ad+CWT representative groups of 2014 brood year Lostine River, Lookingglass Creek and Catherine Creek and 100% of Upper Grande Ronde River spring Chinook Salmon at Lookingglass Fish Hatchery (Table 3).

This task was completed. We attempted to insert coded-wire tags into and clip adipose fins from 100% of the BY 2013 Imnaha River salmon included in the treatment and control groups for the Acclimated (control) vs. Direct Release (treatment) study (Table 4). The Growth Modulation Study was not conducted because we could not get co-manager approval.

Task 5.6. Mark Ad+CWT 100% of at least five raceways [three raceways for the production/control (acclimated) group and two raceways for the direct release group] of Imnaha River BY 2014 Chinook Salmon in order to adequately evaluate the Acclimated vs. Direct Release and Growth Modulation studies (Table 3).

Task 5.7. Recover CWTs and calculate harvest, stray and smolt-to-adult return and survival rates (SAR and SAS) for hatchery Chinook Salmon and steelhead.

This task was completed. We collected snouts from all adipose fin-clipped Chinook salmon spawned at Lookingglass Hatchery and trap morts, and from nearly all carcasses recovered on spawning ground surveys. The snouts were sent to the ODFW CWT Lab in Clackamas for recovery and reading. The resulting CWT data will be entered into the PSMFC database. Snouts are also collected, by various agencies, from ocean and freshwater fisheries, and other (stray) locations. When the final data are available, they will be used to calculate SAR and SAS and incorporated into annual reports.

Snouts from ventral fin clipped adult steelhead (indicating the presence of a CWT) were collected during creel surveys and at hatchery facilities on the Wallowa River and Little Sheep Creek. Coded wire tag derived SAR, SAS and harvest rates of steelhead released at LSRCP facilities in Oregon is presented in the 2013 Annual Progress Report.

Task 5.8. PIT-tag 2,000 (500 tags per raceway) brood year 2013 Upper Grande Ronde River stock to be released into the Upper Grande Ronde River and 5,000 (1,250 tags per raceway) brood year 2013 Lookingglass Creek stock Chinook Salmon to be released directly from Lookingglass Fish Hatchery. PIT tags are also implanted into Catherine Creek and Imnaha River Chinook (supplied by the Comparative Survival Studies Program) and into Lostine River Chinook (supplied by NPT; Table 4).

This task was completed. We inserted ~500 PIT tags into each raceway of Upper Grande Ronde River and Lookingglass Creek Chinook salmon parr (Table 4). We also inserted ~20,000 PIT tags into the Catherine Creek and Imnaha River Chinook salmon as part of the Comparative Survival Studies Program, and into ~3,500 Lostine River Chinook salmon for NPT. PIT tags were used to assess juvenile migration timing and survival to Lower Granite Dam and, if enough fish were tagged, for in-season adult run estimates.

Task 5.9. Use PIT tags to assess juvenile migration performance, including downstream migration timing and survival to LGD, as well as adult return timing and survival through the Columbia and Snake rivers dams and back to weirs and for in-season adjustments to pre-season estimates.

This task was completed. During this report period we downloaded and summarized juvenile and adult steelhead and Chinook PIT-tag recoveries which allow for calculations of downstream migration timing and survival to LGD, as well as adult return timing and survival through the Columbia and Snake rivers dams and back to weirs.

Task 5.10. Compare smolt-to-adult survival rates of Wallowa and Imnaha stock steelhead to Bonneville Dam and smolt-to adult return rates to the LSRCP area estimated using PIT tag and CWT recoveries.

This task was completed. During this report period we downloaded and summarized PIT-tag recoveries which allow for calculations of smolt-to-adult survival to Bonneville Dam and smolt-to-adult return to the LSRCP area for brood year 2011. To date, coded-wire-tag recovery is complete for brood year 2009 (the sixth year of increased PIT tagging) and mostly complete for brood year 2010, but incomplete for brood year 2011. We will make the comparison in our annual reports when CWT recoveries allow. Summaries of these findings were also reported in a poster at the American Fisheries Society 2015 national meeting.

Table 3. Summary of brood year 2014 groups of Chinook Salmon that will be coded-wire tagged and adipose fin clipped in FY 2015. Note: these estimates are based on expected smolt production for all streams at full production.

Stock, release/experimental group	Number of raceways	Number of CWTs		Fin clip (adipose)	
		Number / raceway	Total number	Number / raceway	Total number
Imnaha River					
Production/Control	5	60,000	180,000	60,000	300,000
Direct Release	2	60,000	120,000	60,000	120,000
Catherine Creek					
Late	3	30,000	90,000	50,000	150,000
Upper Grande Ronde River					
Early	2	62,500	125,000	31,250	62,500
Late	2	62,500	125,000	31,250	62,500
Lookingglass Creek					
Early	2	45,000	90,000	62,500	125,000
Late	2	45,000	90,000	62,500	125,000
Lostine River					
Early	2	23,000	46,000	62,500	125,000
Late	2	23,000	46,000	62,500	125,000
Total	22		912,000		1,195,000

Table 4. Summary of brood year 2014 groups of Chinook Salmon that will be PIT-tagged in FY 2015.

Species, stock, purpose of tagging	PIT tags		Release		
	Number	Source	Size	Date	Location

Imnaha River Production	21,000	CSS	20 g	March	Imnaha Acclimation Site
Catherine Creek Conventional Broodstock	21,000	CSS	20 g	March / April	Catherine Creek Acclimation Site
Grande Ronde River Conventional Broodstock	2,000	LSRCP	20 g	March / April	Upper Grande Ronde River Acclimation Site
Lookingglass Creek Conventional Broodstock	5,000	LSRCP	23 g	March / April	Lookingglass Fish Hatchery
Lostine River Conventional Broodstock	2,300	NPT	20 g	March / April	Lostine River Acclimation Site

Objective 6. Coordinate spring Chinook Salmon broodstock marking programs for Lookingglass Fish Hatchery.

Task 6.1. Develop and coordinate spring Chinook Salmon broodstock management strategies and marking programs for Grande Ronde and Imnaha basins production programs to identify broodstock source of returning adults.

This task was completed. ODFW Research personnel coordinated with ODFW Hatchery personnel and Hatchery and Research personnel from CTUIR, NPT, and LSRCP at the Annual Operating Plan meetings to develop broodstock management strategies for each stock and marking programs to identify hatchery salmon upon their return as adults.

Fishery Catch Estimation and Sampling

Objective 7. Determine the number of summer steelhead harvested annually and angler effort in recreational fisheries on the Grande Ronde, Wallowa, and Imnaha rivers.

Task 7.1. Conduct creel surveys for steelhead on the lower Grande Ronde River from 1 October 2014 to 31 March 2015 and for September 2015 between Wildcat Creek in Oregon to Boggan's Oasis (where State Highway 3 crosses the river in Washington); at the mouth and along the mainstem Wallowa River from 1 February 2015 to 15 April 2015; and on the Imnaha River from 1 February to 15 April 2015.

This task was completed on schedule.

Task 7.2. Collect snouts from coded-wire-tagged fish, decode tags, and estimate number of fish harvested for each tag code in each fishery.

This task was completed. Estimates of number of fish harvested for the 2012-13 run year are published in this year's Annual Creel Survey Report.

Task 7.3. Summarize punch card information. Combine this information with creel data. Generate summaries for the steelhead fishery.

This task was completed (see task 7.2) on schedule.

Task 7.4. Write a progress report summarizing findings of creel surveys for the 2012-2013 summer steelhead fishery.

This task was completed in September, 2015.

ESTIMATING PROJECT AREA ESCAPEMENT

Returns to Compensation Area

Objective 8. Determine if the total production of spring Chinook Salmon and summer steelhead adults meet compensation goals and index annual smolt survival and adult returns to Lower Granite Dam for production groups.

Subobjective 8.1. Estimate numbers of spring Chinook Salmon and summer steelhead adults that escape to the Columbia River, past Lower Granite Dam and to program streams.

Task 8.1.1. Determine size, age, sex and origin of adult spring Chinook Salmon and summer steelhead returning to LSRCP facilities and program streams.

This task was completed. All Chinook Salmon returning to weirs were measured for fork length, from which we estimated the age of the fish. Sex was also determined and origin determined from the presence or absence of marks and/or tags. If the fish was taken to Lookingglass Hatchery for spawning or the carcass was recovered on spawning grounds, scales and/or the snout were taken to confirm the age of the fish, and the fork length was measured. From these data, we developed a length at age relationship for each population by origin, from which salmon that were only measured for fork length could be assigned an age.

Information pertaining to size, age, sex and hatchery or natural origin of adult steelhead returning to LSRCP facilities in Oregon are reported in the 2013 Annual Progress Report, completed in September of 2015. This information was also collected in 2015 for reporting in the 2015 Annual Progress Report.

Task 8.1.2. Acquire CWT recovery data on ocean, Columbia River and Snake River fisheries from the monitoring agencies.

This task was completed. CWTs were recovered from all hatchery salmon spawned at Lookingglass Hatchery and steelhead spawned at Wallowa Hatchery, recovered on spawning grounds, in sport fisheries, or sacrificed for tribal subsistence/food banks. The snouts were transported to the ODFW Snout Lab for recovery and reading of the tags. These data were uploaded into the RMIS database, from which we obtained CWT recovery data from other monitoring agencies.

Task 8.1.3. Summarize fishery recovery and escapement information and determine exploitation rates for each stock of spring Chinook Salmon and summer steelhead.

This task was completed. Steelhead fisheries information, including exploitation rates, for the 2012-13 run year is in the Annual Creel Survey Report, submitted to the LSRCP in September of 2015. This information was also collected in the contract period for reporting in the 2014-15 Annual Creel Survey Report. We obtained steelhead and Chinook Salmon CWT recovery data from the RMIS database and summarized those data by population and recovery location to estimate escapements to the Columbia River and home stream, as well as exploitation rates.

Task 8.1.4. Determine total adult escapement (catch plus escapement) to the Columbia River Basin for each stock of Chinook Salmon and steelhead by expansion of CWT-marked recoveries. In addition we will estimate steelhead returns to the compensation area based on PIT-tagged returns. Comparisons will be made between estimates derived from CWTs and PIT tags.

This task was completed. Adult escapement of steelhead to the Columbia River basin is presented in the 2013 Annual Progress Report, submitted in September of 2015. We made comparisons between PIT and CWT derived data for steelhead in a manuscript submitted to the North American Journal of Fisheries Management. We obtained steelhead and Chinook CWT recovery data from the RMIS database. Those data were expanded based on sampling and marking rates and summarized by population to estimate escapements to the Columbia River and home streams. Reporting of these data is usually two years behind the year of recovery, due to the time required to read all of the coded-wire tags.

Task 8.1.5. Determine escapement past Lower Granite Dam for each stock of Chinook Salmon and steelhead.

This task was completed. We obtained CWT recovery data from the RMIS database and summarized those data by population and recovery location to estimate escapements past Lower Granite Dam.

Task 8.1.6. Determine escapement to program streams for each stock of Chinook Salmon and steelhead.

This task was completed. We obtained CWT recovery data from the RMIS database and summarized those data by population and recovery location to estimate escapements to each program stream.

Task 8.1.7. Calculate recruits-per-spawner (R:S) ratio for hatchery and natural Chinook Salmon.

This task was completed. We calculated R:S ratios for the 2010 brood year of natural and hatchery (where appropriate) Chinook Salmon populations from Catherine and Lookingglass creeks and the Imnaha, Lostine, Minam, upper Grande Ronde, and Wenaha rivers.

Task 8.1.8. Calculate recruits-per-spawner ratios for hatchery and natural steelhead returning to Little Sheep Creek.

This task was completed. Progeny to parent ratios for Little Sheep Creek steelhead are presented in the 2013 Annual Progress Report, submitted in September of 2015.

Spawning Ground Surveys

Objective 9. Monitor natural spawning of spring Chinook Salmon and steelhead in northeast Oregon.

Subobjective 9.1. Conduct index, extensive and supplemental spring Chinook Salmon spawning ground surveys in the Grande Ronde and Imnaha basins.

Task 9.1.1. Develop spawning ground survey schedules in cooperation with ODFW District Fish Biologists, CTUIR and NPT.

This task was completed. ODFW Fish Research led the development of spawning ground survey schedules and logistical details in collaboration with ODFW district fish biologists and biologists from CTUIR and NPT.

Task 9.1.2. Conduct spawning ground surveys in the streams and sections listed in Table 5. Mark all new redds observed. Record the numbers of redds, live adults and jacks observed (on and off redds) and carcasses recovered.

This task was completed. All streams were successfully surveyed the planned number of times (usually three surveys), except the Minam and Wenaha Rivers, due to forest fires that limited access. Two (instead of three) surveys were conducted in the Minam River, due to smoke from nearby fires, but all reaches were surveys at least once. Only one survey

(of the usual two) was conducted in the Wenaha River and only the upper half of the reaches was able to be surveyed, due to an active fire in the Wenaha River canyon. Numbers of redds, live adults and carcasses recovered were recorded.

Task 9.1.3. Record the sex, length, fin marks, opercle marks and any tags from carcasses observed on surveys. Collect snouts from adipose fin-marked salmon and scale samples from unmarked salmon for age determination of hatchery and natural salmon, respectively. Send snouts to Clackamas snout lab for processing. All carcasses will be sampled, where feasible. Where there are large numbers of hatchery carcasses, snouts may be subsampled. Determine hatchery:natural salmon ratios for all streams based on marked and unmarked carcass recoveries and scale analyses.

This task was completed. We had to subsample carcasses on the Imnaha and Lostine rivers, due to high numbers of natural spawners – all carcasses were counted, noted for marks, and length and sex were recorded but snouts/scales were collected from only a portion of the carcasses. All snouts were sent to the ODFW Clackamas Snout Lab for processing and scales were pressed and read by ODFW Fish Research staff in La Grande. From these data, hatchery:natural ratios were calculated.

Task 9.1.4. Number and mark redds observed. Remove the tails from carcasses sampled to avoid multiple sampling.

This task was completed. All identified redds were marked with flagging and numbered sequentially. All recovered carcasses had tails removed following processing.

Task 9.1.5. Compare run timing, spawn timing and spawning distribution between hatchery and natural salmon returning to surveyed streams.

Task 9.1.6. Collect genetics samples from all Chinook Salmon released above the Imnaha River weir and from all unpunched salmon recovered on spawning ground surveys to determine whether opercle punches are being accurately detected.

Subobjective 9.2. Determine how adequately historic index surveys measure current spawner abundance.

Table 5. Location and length (km) of spring Chinook Salmon spawning ground survey areas in northeast Oregon streams. Index surveys are conducted in historical areas and at the same time each year. Extensive surveys are conducted in additional areas on the index date. Supplemental surveys are conducted after the index date and include both index and extensive areas.

	Survey type		
Basin, stream and location of survey	Index	Extensive	Supplemental

Imnaha River Basin			
Big Sheep Creek			
Road 39-140 Bridge to Coyote Creek	4	9	None
Imnaha River			
Forks to Freezeout Creek*	9.7	33.2	23.7
Lick Creek			
Coverdale Rd. culvert to bottom of meadow	3.2	0.3	3.5
Grande Ronde River Basin			
Bear Creek			
2 miles above Guard station to Road 8250 Bridge	8.5	2	None
Butte Creek (tributary to Wenaha River)			
Lower 1.5 Miles	None	1.5	None
Catherine Creek			
Forks to 2nd Union City bridge	7.5	14.5	14.5
North Fork Catherine Creek			
North Fork Campground to mouth	4	None	4
South Fork Catherine Creek			
Road barrier to mouth	2	2.7	2.7
Grande Ronde River			
Three Penny Claim to Starkey Bridge*	8.5	22.2	22
Hurricane Creek			
Gravel pit to mouth	3	None	1.3
Lookingglass Creek			
Summer Creek to mouth	6.2	10	None
Lostine River			
Lapover Meadow to mouth*	3	17	2
Minam River			
Elk Creek to Bluff*	8.9	4.3	6.7
Wallowa River			
McClaren Lane Bridge to Hatchery intake	4.5	None	None
Wenaha River			
Forks to Crooked Fork	None	15.5	15.5
North Fork Wenaha River			
Lower 4 miles	None	4	None
South Fork Wenaha River	6	6	6

*Only selected reaches within this area are surveyed. Length of survey given is amount actually surveyed, not distance from top to bottom.

Task 9.2.1. Calculate the percentage of total redds observed in the index area on the day of the extensive-index count for 2015.

This task was completed. We have conducted these analyses for Catherine Creek and the Imnaha, Lostine, Minam, upper Grande Ronde and Wenaha rivers and are preparing a report on the effectiveness of index counts vs. more complete counts in these streams.

Task 9.2.2. Calculate the percent increase in redds in supplemental survey areas

from the first to last counts for 2015.

This task was completed. We have conducted these analyses for Catherine Creek and the Imnaha, Lostine, Minam, upper Grande Ronde and Wenaha rivers and are preparing a report on the effectiveness of index counts vs. more complete counts in these streams.

Subobjective 9.3. Determine the relationship between number of redds observed and Chinook Salmon escapement.

Task 9.3.1. Mark all Chinook Salmon that are released above weirs on the Imnaha River, Catherine Creek, Lookingglass Creek, Lostine River and Upper Grande Ronde River with an opercle punch.

This task was completed. ODFW, CTUIR and NPT have marked all Chinook handled at and released above weirs with an opercle punch. These punches were identified on carcasses recovered on spawning ground surveys and used to calculate a population estimate for salmon above the weir.

Task 9.3.2. Conduct surveys to enumerate total redds above and below the weirs and to recover carcasses and record data collected from them.

This task was completed. Three surveys were conducted on most of the streams listed in Table 5. Total redds were enumerated in each reach. Fork length, sex and marks/tags were recorded from all carcasses. Snouts and/or scales were collected from all fish, except when we had to subsample on the Imnaha and Lostine rivers – subsampling rates varied with reach. Genetic samples were taken from salmon on Catherine Creek and the Imnaha, Lostine and upper Grande Ronde rivers. Kidney samples were collected from carcasses with an intact abdominal cavity.

Task 9.3.3. Determine total escapement by origin, age and sex above the weirs, based on marked:unmarked ratios.

This task was completed. We used presence/absence of opercle punches on carcasses recovered above weirs on Catherine Creek and the Imnaha, Lostine and upper Grande Ronde rivers to estimate escapement above weirs by origin, age and sex. We used that estimate and the number of redds identified above the weir to calculate the number of fish/redd above the weir. That ratio was used to estimate total numbers of fish below the weirs.

Task 9.3.4. Calculate fish:redd ratios.

This task was completed. Total numbers of redds and escapement estimates above weirs were used to calculate fish/redd ratios for all

streams with weirs – Catherine Creek and the Imnaha, Lostine and upper Grande Ronde rivers.

Task 9.3.5. Use fish:redd ratio, number of redds below the weir, and origin, age and sex composition of carcass recoveries and weir collections to estimate the number of spawners below each weir by origin, age and sex. Add the estimated number of spawners below each weir to the estimated number of spawners above each weir to estimate total number of spawners in each stream. Add that to the number of salmon removed (for hatchery broodstock, outplanting, or ceremonial/subsistence) and estimated pre-spawn mortality to estimate total escapement to the stream by origin, age and sex.

This task was completed. We conducted these analyses for all streams with weirs – Catherine Creek and the Imnaha, Lostine and upper Grande Ronde rivers. The fish/redd ratio for the Imnaha River was used to estimate escapement to the Minam River. Escapement into the Wenaha River may not be estimated for 2015 due to our inability to survey all reaches due to forest fires..

Subobjective 9.4. Determine age-composition and length-age relationships for spring Chinook Salmon in each stream sampled.

Task 9.4.1. Mount, press and age (years in fresh and saltwater) scales collected from carcasses sampled on spawning ground surveys.

This task was completed. Scales collected from natural salmon on spawning grounds and at Lookingglass Hatchery were aged independently by two persons without knowledge of the length of the fish. If the two age estimates differ, the scales were reexamined with the aid of the fork length to determine a final age estimate.

Task 9.4.2. Calculate age composition and determine mean length of each age class for populations of hatchery and natural Chinook Salmon in each stream surveyed.

This task was completed. Age composition (percent of all returning fish comprising ages 3, 4 and 5) and mean length at age were calculated after ages were determined for all salmon from which scales or CWTs were collected.

Subobjective 9.5. Assist with steelhead spawning ground surveys above weir in Deer Creek (Wallowa River tributary) above the Big Canyon acclimation facility.

Task 9.5.1. Develop a spawning ground survey schedule in cooperation with the Grande Ronde Juvenile Salmonids and Adult Steelhead Project.

This task was completed.

Task 9.5.2. Assist with surveys to enumerate total redds and live fish above weir.

This task was completed.

Task 9.5.3. Georeference all identified redds during last spawning ground survey.
This task was completed.

Subobjective 9.6. Support NOAA Fisheries study of natural production of hatchery and natural steelhead above weir on Little Sheep Creek.

Task 9.6.1. Electrofish representative sample reaches to collect steelhead parr and obtain tissue using fin clips. Also electrofish additional areas as needed to collect tissue samples from resident *O. mykiss* adults.

This task was completed. Electrofishing occurred from August 11-13, 2015.

Task 9.6.2. Catalog and deliver tissue samples to NOAA Fisheries Service for analysis.

This task was completed. Tissue samples from juvenile *O. mykiss* and samples from natural and hatchery adults that returned to Little Sheep Creek weir were delivered to NOAA.

SMOLT-TO-ADULT SURVIVAL AND PRODUCTION

We completed smolt-to-adult survival and productivity (recruits per spawner) estimates. See objective 5 for tagging accomplishments used to generate data for the estimates and objective 8 for survival and recruits per spawner.

LEGAL OBLIGATIONS

Objective 10. Participate in planning activities associated with anadromous fish production and management in the Grande Ronde and Imnaha river basins as well as participate in ESA permitting, consultation and recovery activities.

Task 10.1. Analyze data to guide planning processes in the Grande Ronde and Imnaha river basins and to provide appropriate information to the ESA process.

This task was completed. Hatchery and natural production data were provided to the Independent Scientific Review Panel, the Fish Passage Center, NOAA BRT, NOAA's ESA Recovery Planning processes, AMIP Life Cycle Monitoring Workgroup, and AMIP reintroduction workgroup.

Task 10.2. Continue to provide information for development of subbasin management plans and basin-wide research activities.

This task was completed. Staff coordinated with district biologists and biologists from co-management agencies and presented results at scientific meetings.

Task 10.3. Review and comment on future Chinook Salmon production and facilities being planned under NEOH.

This task was completed. We provided information to guide development and modification of hatchery facilities for both the Imnaha and Lookingglass Hatchery facilities.

Task 10.4. Participate in ESA activities as requested by ODFW, USFWS and NOAA Fisheries, including FMEP, HGMP, Biological Assessment, Section 10 document preparation and reporting and TRT status and limiting factors analyses.

This task was completed. Staff participated in numerous meetings and led development of numerous sections of Oregon's HGMPs. Provided population abundance and productivity data to NOAA Fisheries for the recent five-year status review. Reviewed and commented on the NOAA Five-year Review.

Task 10.5. Participate in planning and implementation activities for developing population specific management and recovery plans for Grande Ronde and Imnaha populations as specified in the Snake River spring/summer Chinook Salmon recovery plan.

This task was completed. Staff worked closely with NOAA in development of the northeast Oregon Chinook and steelhead ESA Recovery Plan, led the ODFW review process of the NOAA Plan and presented life history limiting factors and life cycle survival information to the NE Oregon Recovery Plan Sounding Board and BPA habitat expert panel.

Task 10.6. Participate on LSRCP technical teams that will develop analytical methods and databases for LSRCP stock assessments and LSRCP annual reports.

This task was completed. Staff participated in meetings and conference call discussions for the formation of methods and databases.

ELECTRONIC DATABASE SYSTEMS

The LSRCP Oregon Evaluation Studies Project is developing a central relational Access database for storage, analysis and distribution of LSRCP RM&E data. Data have been stored in numerous Excel spreadsheets and small Access databases, which have become cumbersome and inefficient. PIT tag data are uploaded and downloaded from the PSMFC PTAGIS database and coded-wire tag data are downloaded from the PSMFC RMIS database. Staff has been

participating in the basinwide Coordinated Assessment project to pilot the Data Exchange Standard (DES) data sharing approach. We are providing the LSRCP office with annual data updates via the LSRCP production and survival spreadsheets. Natural population abundance and productivity data are provided to the ODFW Recovery Tracker database, NOAA's SPS database, and StreamNet. Work will continue on coordinating data transfer of natural population indicators in the DES format. In addition, DES's for hatchery indicators have been adopted, and we will continue working with the Coordinated Assessment project to develop databases and transfer processes for the hatchery indicators.

REGIONALLY SIGNIFICANT RESEARCH

Chinook Salmon Life History

Objective 11. Monitor and assess productivity, abundance, hatchery fraction and life history characteristics of hatchery- and naturally-produced Chinook Salmon in the Grande Ronde and Imnaha river basins.

Subobjective 11.1. Assess the productivity and life history characteristics of all supplemented populations in the Grande Ronde and Imnaha river basins using data collected from weir collection, spawning ground surveys and hatchery spawning.

Task 11.1.1. Estimate and compare smolt-to-adult survival rates for hatchery- and naturally-produced Chinook Salmon and examine for changes over time in all Grande Ronde and Imnaha river basin supplemented populations.

This task was completed. We calculated smolt-to-adult survival rates (SAR) for hatchery and natural salmon through the 2010 brood year for Catherine Creek and the Imnaha, Lostine, Minam and upper Grande Ronde rivers. Natural smolt numbers were provided by ODFW's Early Life History Project. SARs were compared over time to look for trends.

Task 11.1.2. Estimate and compare recruit:spawner ratios for hatchery- and naturally-produced Chinook Salmon and examine for changes over time in the Grande Ronde and Imnaha river basin populations.

This task was completed. We calculated recruit:spawner (R:S) ratios for hatchery and natural salmon through the 2010 brood year for Catherine Creek and the Imnaha, Lostine, Minam, upper Grande Ronde and Wenaha rivers. R:S ratios were examined over time to look for trends. We also compare productivity, total spawner abundance and natural origin abundance between the supplemented Imnaha population and unsupplemented populations in Idaho.

Task 11.1.3. Compare productivity, total spawner abundance and natural origin abundance between the supplemented Imnaha River population and unsupplemented populations in Idaho.

Task 11.1.4. Estimate and compare run timing (to weir) for hatchery- and naturally-produced Chinook Salmon and examine for changes over time in all Grande Ronde and Imnaha river basin supplemented populations.

This task was completed. We estimated run timing for hatchery and natural Chinook on Catherine Creek and the Imnaha, Lostine and upper Grande Ronde rivers. These estimates were based on weir capture and punched:unpunched ratios above weirs. We examined these data for trends over time.

Task 11.1.5. Estimate and compare spawn timing in nature and in captivity for hatchery- and naturally-produced Chinook Salmon and examine for changes over time in all Grande Ronde and Imnaha river basin populations.

This task was completed. Spawn timing in nature was estimated based on recovery of female and male (separately and pooled) carcasses on each of three spawning ground surveys. Spawn timing at Lookingglass Hatchery was based on the date on which a fish was spawned. We monitor these data for changes in mean (and first and last in the hatchery) spawn date over time.

Task 11.1.6. Estimate and compare spawning distributions for hatchery- and naturally-produced Chinook Salmon and examine for changes over time in all Grande Ronde and Imnaha river basin populations.

This task was completed. Spawning distributions are based on female carcass recoveries on spawning ground surveys. Female carcasses, by origin, recovered in each reach were enumerated and used to calculate percentages of carcasses recovered in each reach. Changes in those percentages over time were examined to monitor spawning distributions.

Task 11.1.7. Estimate and compare age structures of returning adult hatchery- and naturally-produced Chinook Salmon and examine for changes over time in all Grande Ronde and Imnaha river basin populations.

This task was completed. Age structures (the percentage of fish returning at ages 3, 4 and 5) were determined for the 2010 brood year for each origin and sex. These percentages are monitored for changes over time.

Task 11.1.8. Estimate and compare sizes-at-age of returning adult hatchery- and naturally-produced Chinook Salmon and examine for changes over time in all Grande Ronde and Imnaha river basin populations.

This task was completed. Population sizes of naturally-produced Chinook were estimated using mark:recapture estimates and/or fish/redd ratios in all surveyed streams. These numbers are monitored for changes over

time.

Task 11.1.9. Collect tissue samples to provide to NOAA Fisheries for genetic analysis between hatchery- and naturally-produced Chinook Salmon and examine them for changes over time in the Grande Ronde and Imnaha river basins.

This task was completed. ODFW attempted to collect genetic samples from all recovered salmon from Catherine Creek and the Imnaha, Lostine and upper Grande Ronde rivers. These samples were sent to NOAA Fisheries for storage and analysis.

Task 11.1.10. Estimate total natural spawner and natural-origin spawner abundance for populations of Chinook Salmon and examine for changes over time in all Grande Ronde and Imnaha river basin populations.

PEER REVIEW, BIOMETRIC REVIEW, ANALYSIS, REPORTING, AND LSRCP PROGRAM REVIEW

Objective 12. Complete reports of progress that summarize results of our work and participate in the planning, development and execution of the LSRCP Program Review.

Task 12.1. Write and submit the following annual reports and data summaries:

Title	Period covered	Final report date
Lower Snake River Compensation Plan, Hatchery Evaluation Studies:		
Chinook comprehensive	2013	30 September 2015
Steelhead comprehensive	2013	30 September 2015
Summer steelhead creel surveys	2012-2013	30 September 2015

We completed the 2012-13 Steelhead Creel Survey report the 2013 Annual Steelhead Progress Report in September, 2015. The 2013 Chinook comprehensive report has not been completed.

Task 12.2. Prepare the following manuscripts for review and publication:

Title	Due Date
Size of Release of Chinook Salmon Smolts into the Imnaha River	30 September 2015
Proximate Factors Affecting Survival and Straying in a Hatchery Steelhead Stock	30 September 2015

Rather than write the manuscript listed in Task 12.2, we re-wrote and re-

submitted a manuscript from the Autumn Line broodstock experiment titled “Harvest and straying of two hatchery steelhead strains, one derived from the other by temporal broodstock selection.” It was submitted to the North American Journal of Fisheries Management but was not accepted for publication. It may be submitted to a different journal in FY2016.

A paper titled, The Influence of Size-at-release on Performance of Imnaha River Chinook Salmon Hatchery Smolts, was submitted to the North American Journal of Fisheries Management and accepted for publication on 11 December 2015.

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