

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 2016- 30 September 2017. 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 pre-season escapement predictions and run composition to LSRCP facilities that are presented in the 2017 Annual Operations Plans for Chinook Salmon (Table 5) and steelhead (Table 5). In-season estimates for Chinook Salmon based on PIT tag expansions and run timing were distributed in weekly e-mails. In-season estimates were also discussed with co-managers in weekly conference calls that occurred from April-July 2017. 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. All trapping records for Chinook Salmon captured at the Imnaha River weir, the Lookingglass Creek weir, and the Lostine River weir were entered into the Fish Inventory System (FINS) maintained by the Pacific States Marine Fisheries Commission (PSMFC). The Imnaha River and Lookingglass Creek Chinook records were maintained by the ODFW and Lostine River records were maintained by the NPT. 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 2018 are in the 2018 Annual Operations Plan. Actual run timing, spawn timing, pass/keep scenarios, and spawning matrices for run year 2015 were published in the 2015 Annual Progress Report (completed September 2017). These metrics were also recorded for adults returning in 2017.

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 access 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 2016 Annual Progress Report. These metrics were recoded for adult returns in 2017.

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. These data were collected from all female Chinook Salmon spawned at Lookingglass Hatchery. Fecundity was determined by Lookingglass Hatchery personnel using an egg counter. Mean egg weight was estimated by ODFW Research personnel by individually weighing 20 eyed eggs from each female. These data have been incorporated into our Chinook Salmon access 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 and transfer samples to the appropriate entity for analysis.

This task was completed. ODFW Research personnel collected genetic samples (opercle punches) from all Chinook Salmon spawned at Lookingglass Hatchery. Samples were sent to the Idaho Fish and Game Eagle Genetics lab for analysis.

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 422 natural-origin juveniles and 36 hatchery residuals were collected from Little Sheep Creek and sent to NOAA Fisheries for a Relative Reproductive Success

study, 3. Samples from 482 mixed origin Little Sheep stock adults went to NOAA Fisheries or Matt Campbell (IDFG), and 472 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 access 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 2015 Annual Progress Report published in September 2017. The disposition of steelhead returning to facilities in 2017 was recorded and will be reported in the 2017 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 and transfer them to the ODFW CWT Lab for analysis.

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. Collect individual fecundity (green eggs) and number of eyed eggs 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. Calculate fertility rates (percent of green eggs reaching the eyed stage) for spring Chinook Salmon and egg-to-fry and fry-to-smolt survival rates for each stock of summer steelhead and spring Chinook Salmon.

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 used 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 2015 Annual Progress Report published in September of 2017. This information was also collected in 2017 for reporting in the 2017 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 2015 Annual Progress Report published in September of 2017. This information was also collected in 2017 for reporting in the 2017 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 or conventional broodstock) and ages (4 and 5) of females. Collect individual length and weight measurements from a sample of juveniles during coded-wire tagging, PIT tagging, and prior to release.

This task was completed. All eggs (BY 2016; FY 2017) were weighed in 2016. Individual lengths (BY 2015; FY 2017) were collected from 250 parr and weights (and condition factor calculated) from 50 parr 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.

Field work for this task was completed in 2017. Pre-release sampling from brood year 2014 is reported in Table 3 of the 2015 Annual Progress Report published in September of 2017.

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 2016. At Little Sheep and Big Canyon, 52% of fish remaining after volitional release were males. Since < 70% were males at both facilities, all remaining in the acclimation ponds were force-released.

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 2017 Annual Operating Plan meetings held in December 2016 for steelhead and February 2017 for Chinook Salmon.

Task 2.2.7. Collect tissue samples for genetic analyses from Chinook Salmon (50 samples/stock) and steelhead spawned in Lookingglass and Wallowa fish hatcheries.

This task was completed. Genetic samples were collected from Chinook Salmon handled spawned at Lookingglass Hatchery by ODFW, CTUIR, and NPT Hatchery Production and Research personnel. Chinook Salmon samples were sent to the Idaho Fish and Game Eagle Genetics lab for analysis (Snake Basin Parentage-Based Tagging). See task 2.1.5 for a description of steelhead genetic collections.

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 Gabriel Garza, ODFW's Systems Support Specialist, for quality control checks and subsequent transfer to RMIS. The 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. Provide summarized data to LSRCP.

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 2015 Annual Progress Report completed in September 2017.

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 incidental mortalities of hatchery and natural smolts at screw traps.

This task was completed. ODFW Fish Health personnel collected kidney tissues from ~60 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 42 samples and had a target of at least 20 samples from each sampled stream. We did not achieve our target of 20 samples for any stream because of low adult return rates and the absence of carcasses to sample.

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.

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 smolts recovered at traps or mainstem dams from smolts released from ponds.

This task was completed. Outmigrating juvenile PIT-tag detection files from releases in 2017 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 2014 and 2015 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 2015 Annual Report completed in September 2017.

Task 4.1.3. Sample for residual steelhead abundance in index streams at index areas during summer of 2017.

This task was completed. Residual steelhead sampling at index sites in Deer and Little Sheep creeks was conducted in August 2017.

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 manuscript from this work was published in the journal *Fisheries Management and Ecology*.

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 mostly complete for second generation releases. In the contract period a manuscript from this work was published in the journal *Fisheries Management and Ecology*.

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 nine brood years of releases, whereas coded wire tag derived estimates are available for the first eight brood years of releases.

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 seven brood years of releases.

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. The 2016 release (BY 2014) was the last release of this study, which began with BY 2010 and was planned to last through BY 2014 (at least five brood years). The 2019 return will complete the study with the final return of BY 2014 salmon.

Task 4.3.1. Continue to monitor returns and provide co-managers and LSRCP with updates.

This task has been completed. We report transfer dates, acclimation dates, and release strategies (i.e., direct vs acclimated) in LSRCP annual reports. For each release group, we report juvenile survival to Lower Granite Dam. Adult returns are summarized in LSRCP annual reports.

Subobjective 4.4. Continue a reciprocal rearing and release study that started 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 is to transport one raceway of smolts (approx. 40,000) 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. Transport will occur in early February. 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 4.4.1. Coded-wire tag and adipose clip BY 2016 juveniles from each of two raceways at Irrigon Hatchery with codes unique to each raceway. In December and January, implant PIT tags into all Wallowa stock release groups.

This task has been completed as planned.

Task 4.4.2. Assist a physiologist from the Abernathy Fish Technology Center with sampling fish in the hatchery (Nov., Dec., Jan.) and in acclimation ponds to assess the physiological development (RNA gene expression, proximate body composition, gill Na⁺/K⁺-ATPase, etc.) of smolts.

This task has been completed as planned.

Task 4.4.3. Compare outmigration survival and migration timing of smolts released in 2017 for this study.

This task has been completed as planned.

Task 4.4.4. Compare out-of-basin stray rates between Irrigon Hatchery-raised smolts that are released from acclimation ponds at Wallowa Hatchery and Cottonwood Acclimation Facility.

The first adult returns from this study were age 3 fish that returned in 2016. Adults stray data has been downloaded from RMIS and will be summarized and reported in the 2016 Annual Report, due in September 2018.

Task 4.4.5. Compare smolt-to-adult survival between the different release groups.

This task was completed using PIT tag derived data. Coded-wire tag data is only available for age 3 adults that returned in 2016. This data has been downloaded from RMIS and will be summarized and reported in the 2016 Annual Report.

Subobjective 4.5. Continue to 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 4.5.1. In brood year 2016 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 has been completed in 2017 as planned.

Task 4.5.2. Compare outmigration survival and migration timing of smolts released in 2017 for this study.

This task has been completed as planned.

Task 4.5.3. Compare out-of-basin stray rates between smolts that are transferred to acclimation ponds at Wallowa Hatchery in January and February.

Coded-wire tag stray data is only available for age 3 adults that returned in 2016. This data has been downloaded from RMIS and will be summarized and reported in the 2016 Annual Report.

Task 4.5.4. Compare smolt-to-adult survival between smolts that are transferred to acclimation ponds at Wallowa Hatchery in January and February.

Coded-wire tag data for survival calculation is only available for age 3 adults that returned in 2016. This data has been downloaded from RMIS and will be summarized and reported in the 2016 Annual Report.

New Proposals for Optimum Production Studies

Subobjective 4.6. Collaborate and coordinate with hatchery, management, and research biologists from ODFW and co-management agencies to develop studies to solve issues with these hatchery programs and improve the effectiveness of them.

Obtain input from hatchery, management, and research biologists from ODFW, co-management agencies, LSRCP, and NOAA Fisheries to develop a list of issues to be addressed to improve the effectiveness of Chinook hatchery supplementation programs in the Grande Ronde and Imnaha basins. We will endeavor to develop a list of issues that all agencies agree should be addressed and prioritize them. We will collaborate with research biologists from the co-management agencies (with input from hatchery and management) to develop alternatives for addressing these issues and scientifically rigorous studies to test these alternative actions.

Subobjective 4.7. Continue proof-of-concept investigations to explore whether luring sexually maturing male steelhead into a trap during acclimation is a viable way of reducing numbers of residual steelhead released into streams.

The 2012 ISRP review of LSRCP steelhead hatchery programs urged managers to investigate new approaches for reducing the number of residual steelhead released into streams. In release year 2016 we began a small scale proof-of-concept study to investigate whether female sex pheromones could be used to lure sexually maturing residual males into a box trap placed in an acclimation pond. Our efforts in 2016 did not successfully lure maturing males into a deployed trap, possibly because the drip system used to meter out the pheromones clogged during the 24 h deployment. In 2017 we will modify our metering system and attempt the pilot study again.

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 2016 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 2).

Task 5.2. PIT tag 4,000 Autumn Line (Ad-RV-CWT or Ad-RV or AD only), 5,000 standard production (Ad-LV-CWT or Ad only), 1,000 late transport to acclimation (AD-CWT or AD-only, 4,000 transport to Cottonwood Creek (AD-CWT or AD-only) summer steelhead progeny of the 2016 brood year (14,000 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 2).

Task 5.3. Mark (Ad- CWT) one group of 25,000, 2016 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 LSRCF area.

This task was completed.

Task 5.4. Mark (Adipose clip) 100% of the BY 2016 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 from each stock.

Table 2. Summary of brood year 2016 groups of steelhead that were coded-wire tagged and fin-clipped and PIT tagged in FY 2017. WAP = Wallowa acclimation ponds at Wallowa Hatchery; BC = Big Canyon facility, LF = Lyon’s Ferry Hatchery, CC = Cottonwood Creek Acclimation Pond.

Stock, release group	Acclima- tion Pond ^a	No. of CWTs	Fin Clip	LSRCF PIT tags	CSS PIT tags	Total PIT tags
<u>Wallowa stock</u>						
WAP, early transfer, April release	U	25,000	Ad	1,000	1,300	4,000
WAP, Autumn Line, early transfer, April release	U	25,000	Ad-RV	1,000	1,200	3,900
WAP, early transfer, April release	L	25,000	Ad-LV	1,000	600	1,900
WAP, late transfer, April release		25,000	Ad	1,000	400	1,200
WAP, Autumn Line May	L	25,000	Ad-RV	1,000	700	2,200
LF, early transfer, April release				1,000	0	1,000
CC, early transfer, April release	N/A	25,000	Ad	4,000	0	4,000
BC, forced April	U	25,000	Ad	1,000	1,000	3,200
BC, Autumn Line April	U	25,000	Ad	1,000	400	1,200
BC, forced May	L	25,000	Ad	1,000	1,100	3,400

BC, Autumn Line May	L	<u>25,000</u>	Ad	<u>1,000</u>	<u>300</u>	<u>1,000</u>
Subtotal		250,000		14,000	7,000	21,000
<u>Imnaha stock</u>						
Little Sheep, vol. April	27	25,000	Ad	3,000	2,500	5,500
Little Sheep, vol. April	29	–	Ad	3,200	2,700	5,900
Little Sheep, direct April (if agreed)	30	–	Ad	<u>1,800</u>	<u>1,800</u>	<u>3,600</u>
Subtotal		<u>25,000</u>		<u>8,000</u>	<u>7,000</u>	<u>15,000</u>
Grand total		275,000		22,000	14,000	36,000

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

Task 5.5. Mark Ad+CWT representative groups of 2016 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. More detailed results will be presented in LSRCP annual reports.

Task 5.6. Mark Ad+CWT 100% of at least five raceways (three raceways for the production/control group and two raceways for the experimental group) of Imnaha River BY 2016 Chinook Salmon in 68020/78830 order to adequately evaluate the Growth Modulation Study (if it is conducted - see Sub-objective 4.4; Table 3).

Table 3. Summary of brood year 2016 groups of Chinook Salmon that were coded-wire tagged and adipose fin clipped in FY 2017 as of 1 September, 2017.

Stock, release/experimental group	Number of raceways	Number of CWTs		Fin clip (adipose)	
		Number / raceway	Total number	Number / raceway	Total number
<u>Imnaha River</u>					
Production (Acclimated)	4	39,033	156,132	69,265	277,059
Production (Direct)	3	36,415	109,246	71,801	215,402
<u>Catherine Creek</u>					
Production	2	61,570	123,140	61,570	123,140
<u>Upper Grande Ronde River</u>					
Early Release	2	56,401	112,802	28,616	57,223
⁸ Late Release	2	54,922	109,844	27,205	54,410
<u>Lookingglass Creek</u>					
Adult Holding Pond	4	27,565	110,262	41,167	164,670
Raceway	1	44,177	44,177	71,175	71,175

Lostine River

Early	2	24,506	49,013	63,494	126,988
Late	<u>2</u>	41,000	<u>82,000</u>	63,699	<u>127,398</u>
Total	22		896,616		1,217,465

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 adipose fin-clipped Chinook Salmon spawned at Lookingglass Hatchery that had a CWT 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 Willowa 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 2015 Annual Progress Report, published in 2017.

Task 5.8. PIT-tag 2,000 (500 tags per raceway) brood year 2015 Upper Grande Ronde River stock to be released into the Upper Grande Ronde River and 4,000 (1,000 tags per raceway) brood year 2015 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 ~2,00 PIT tags into Upper Grande Ronde River and ~5,000 PIT tags into Lookingglass Creek Chinook Salmon parr (Table 4). We also inserted ~20,000 PIT tags into the Catherine Creek and Imnaha River Chinook Salmon parr as part of the Comparative Survival Studies Program, and ~2,500 PIT tags into 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.

Table 4. Summary of brood year 2015 groups of Chinook Salmon that were PIT-tagged in October 2016 (FY 2017).

Species, stock, purpose of tagging	PIT tags		Release		
	Number	Source	Size	Date	Location
<u>Imnaha River</u>					
Production	20,688	CSS	20 g	April	Imnaha Acclimation Site
<u>Catherine Creek</u>					
Conventional Broodstock	20,811	CSS	20 g	March	Catherine Creek Acclimation Site
<u>Grande Ronde River</u>					
Conventional Broodstock	1,961	LSRCP	20 g	March / April	Upper Grande Ronde River Acclimation Site
<u>Lookingglass Creek</u>					
Conventional Broodstock	4,949	LSRCP	23 g	March / April	Lookingglass Fish Hatchery
<u>Lostine River</u>					
Conventional Broodstock	2,352	NPT	20 g	March / April	Lostine River Acclimation Site

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 salmon 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. Coordinate with ODFW, IDFG, CTUIR, and NPT research and production biologists (through weekly conference calls) during the mature Chinook Salmon migration through the Columbia and Snake rivers to monitor and estimate abundance of mature Chinook Salmon returning to each northeast Oregon population.

This task was completed. Participated in weekly conference calls and distributed weekly e-mails with a spreadsheet that summarized PIT tag estimates of mature salmon returns at Bonneville Dam, McNary Dam, Lower Granite Dam, and detections from various tributary PIT tag arrays in the Grande Ronde and Imnaha River basins.

Task 5.11. 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 2013. To date, coded-wire-tag recovery is complete for brood year 2010 (the sixth year of increased PIT tagging) and mostly complete for brood year 2011, but incomplete for brood year 2012. We will make the comparison in our annual reports when CWT recoveries allow.

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

Task 6.1. Coordinate spring Chinook Salmon broodstock management strategies and develop 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 and Management personnel and Hatchery, Management, 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 2016 to 31 March 2017 and for September 2017 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 2017 to 15 April 2017; and on the Imnaha River from 1 February to 15 April 2017.

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 steelhead harvested for the 2014-15 run year are published in the Annual Creel Survey Report, which was completed in September 2017.

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 2014-2015 summer steelhead fishery.

This task was completed in September 2017.

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 their age. Sex was also determined and origin determined from the presence or absence of marks and/or tags. If the salmon 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. Results are presented in annual LSRCP reports.

Information pertaining to size, age, sex and hatchery or natural origin of adult steelhead returning to LSRCP facilities in Oregon are reported in the 2015 Annual Progress Report, completed in September of 2017. This information was also collected in 2017 for reporting in the 2017 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 2014-15 run year is in the Annual Creel Survey Report, submitted to the LSRCP in September of 2017. This information was also collected in the contract period for reporting in the 2016-17 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.

When Chinook Salmon fisheries occur, sport harvest estimates in the Imnaha River, Lookingglass Creek, and the Wallowa River are obtained from the ODFW District offices in Enterprise and La Grande. Tribal fishery estimates from tributary harvest in the Grande Ronde and Imnaha River basins are supplied by the NPT and CTUIR co-managers. We incorporate these harvest results into our annual LSRCP reports. No sport fisheries occurred in 2017 because of the low number of mature Chinook salmon returns.

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 2014 Annual Progress Report, submitted in September of 2017. Escapement of mature Chinook Salmon to the Columbia basin is presented in the 2015 Annual Progress report, submitted in July of 2017. 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 2012 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 2015 Annual Progress Report, submitted in September of 2017.

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. Mark (opercle punch) 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. Hatchery personnel from ODFW, CTUIR, and NPT operate the weirs and give opercle punches to all salmon released above the weirs.

Task 9.1.3. Conduct spawning ground surveys in the streams and sections listed in Table 5. Number and mark (flagging and GPS coordinates) all new redds observed. Enumerate total redds above and below the weirs. Record the numbers of live adults and jacks observed (on and off redds).

This task was completed. All streams were surveyed. However, we have had problems obtaining permission to access some privately owned reaches on Big Sheep Creek, Catherine Creek, the Imnaha River, the Upper Grande Ronde, the Wallowa River, and Hurricane Creek. Numbers of redds, live adults and carcasses recovered were recorded, and nearly 100% of the Chinook redds were marked with a GPS waypoint.

Task 9.1.4. Record the sex, length, fin marks, opercle marks, and any tags from carcasses observed on surveys. Remove the tails from carcasses sampled to avoid multiple sampling. 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.

This task was completed. 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 9.1.5. Determine hatchery:natural salmon ratios for all streams based on marked and unmarked carcass recoveries and scale analyses.

This task was completed. We determined hatchery:natural ratios for Catherine and Lookingglass creeks and the Upper Grande Ronde, Imnaha, Lostine, Minam, and Wenaha rivers.

Task 9.1.6. Estimate total escapement by origin, age, and sex above the weirs, based on marked:unmarked ratios.

This task was completed. We estimated total escapement by origin, age, and sex above the weirs on Catherine and Lookingglass creeks and the Upper Grande Ronde, Imnaha, and Lostine rivers.

Task 9.1.7. Compare run timing, spawn timing and spawning distribution between hatchery and natural salmon returning to surveyed streams.

This task was completed. We compared run timing, spawn timing and spawning distribution between hatchery and natural salmon for Catherine and Lookingglass creeks and the Upper Grande Ronde, Imnaha, Lostine, Minam, and Wenaha rivers.

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.

Basin, stream and location of survey	Survey type		Minimum number of annual visits
	Index	Extensive	
<u>Innaha River Basin</u>			
Big Sheep Creek			
Road 39-140 Bridge to Coyote Creek	4	9	2
Innaha River			
Forks to Freezeout Creek*	9.7	33.2	3
Lick Creek			
Coverdale Rd. culvert to bottom of meadow	3.2	0.3	2
<u>Grande Ronde River Basin</u>			
Bear Creek			
2 miles above Guard station to Road 8250 Bridge	8.5	2	2
Butte Creek (tributary to Wenaha River)			
Lower 1.5 Miles	None	1.5	1
Catherine Creek			
Forks to 2nd Union City bridge	7.5	14.5	3
North Fork Catherine Creek			
North Fork Campground to mouth	4	None	3
South Fork Catherine Creek			
Road barrier to mouth	2	2.7	3
Grande Ronde River			
Three Penny Claim to Starkey Bridge*	8.5	22.2	3
Hurricane Creek			
Gravel pit to mouth	3	None	2
Lookingglass Creek			
Summer Creek to mouth	6.2	10	3
Lostine River			
Lapover Meadow to mouth*	3	17	4
Minam River			
Elk Creek to Bluff*	8.9	4.3	3
Wallowa River			
McClaren Lane Bridge to Hatchery intake	4.5	None	2
Wenaha River			
Forks to Crooked Fork	None	15.5	2
North Fork Wenaha River			
Lower 4 miles	None	4	Once every 4 yrs
South Fork Wenaha River			
	6	6	2

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

Task 9.1.8. Collect genetic 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. Collect genetic samples from all non-CWT carcasses.

This task was **not** completed. Due to time constraints and staff availability to collect and inventory samples, this task was not completed. Our recommendation is to remove this task from future statements of work.

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

Task 9.2.1. Calculate the percentage of total redds observed in the index area on the day of the extensive-index count for 2017.

This task was completed. We have conducted these analyses for Catherine Creek and the Imnaha, Lostine, Minam, Upper Grande Ronde, and Wenaha rivers.

Task 9.2.2. Calculate the percent increase in redds in supplemental survey areas from the first to last counts for 2017.

This task was completed. We have conducted these analyses for Catherine Creek and the Imnaha, Lostine, Minam, Upper Grande Ronde, and Wenaha rivers.

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

Task 9.3.1. Calculate fish:red ratio for above weir reaches.

This task was completed. Total numbers of redds and escapement estimates above weirs were used to calculate fish/red ratios for all streams with weirs – Catherine and Lookingglass creeks and the Imnaha, Lostine and Upper Grande Ronde rivers.

Task 9.3.2. Use fish:red 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. Escapement to the Minam and Wenaha rivers was estimated through temporal and spatial redd expansions. Population estimates are generated by multiplying the expanded redd estimate by of 3.2 fish/redd.

Task 9.3.3. Use redd counts and total escapement and spawner estimates from spawning ground surveys to examine relationships between redd numbers and total escapement and spawner estimates.

This task was completed. Data are stored in Excel files and Access Databases. Data are also summarized annually and submitted to Stream Net (<http://cax.streamnet.org/>).

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 differed, the scales were reexamined with the aid of the fork length to determine a final age estimate.

Task 9.4.2. Use age-length relationship for salmon with known ages (scales, CWT, or PIT tag) to estimate ages of salmon with lengths but no ages.

This task was completed.

Task 9.4.3. 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 2-4, 2017.

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 Innaha 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 Innaha river basins and to provide appropriate information to the ESA process.

This task was completed. Hatchery and natural production data were provided when requested 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 and participate in 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, presented results at scientific meetings, and responded to data requests.

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

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 meta-data for the PSMFC FINS online database

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 provide the LSRCP office with annual data updates via the LSRCP production and survival spreadsheets. We also check/correct/validate data entered into the FINS database by Lookingglass Hatchery staff and provide feedback to the FINS production staff regarding the program. 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, DESs for hatchery indicators will soon be adopted, and we will continue working with the Coordinated Assessment project to develop databases and transfer processes for the hatchery indicators. We will be working with other LSRCP programs to begin coordination of development of a hatchery performance indicator database that will be used to meet the data management and sharing needs of the ODFW LSRCP Evaluation Project and will help in meeting the requirements established in the hatchery indicator DES's.

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 Chinook Salmon 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 population sizes of naturally-produced adult Chinook Salmon and examine for changes over time in all Grande Ronde and Imnaha river basin populations.

This task was completed. We calculated population estimates for natural salmon in Catherine and Lookingglass creeks and the Imnaha, Lostine, Minam and Upper Grande Ronde rivers. Population estimates were compared over time to look for trends. Annual updates are provided to StreamNet.

Task 11.1.2. Estimate total natural spawner and natural-origin spawner abundance for Chinook Salmon populations and examine for changes over time in all Grande Ronde and Imnaha river basin populations.

This task was completed. We calculated total natural spawner and natural-origin spawner estimates in Catherine and Lookingglass creeks and the Imnaha, Lostine, Minam and Upper Grande Ronde rivers. Population estimates were compared over time to look for trends. Annual updates are provided to StreamNet.

Task 11.1.3. 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 2012 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 11.1.4. Estimate and compare recruit:spawner ratios 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. We calculated recruit:spawner (R:S) ratios for hatchery and natural salmon through the 2012 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 11.1.5. Compare productivity, total spawner abundance, and natural origin abundance between the supplemented Imnaha River population and unsupplemented populations in Idaho.

This task was completed. We compared productivity, total spawner abundance, and natural origin abundance between the supplemented Imnaha River population and Bear Valley, Big, Camas, Loon, Marsh, Sulphur, and Valley creeks and the Lemhi River in Idaho.

Task 11.1.6. 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, based on weir capture and punched:unpunched ratios above weirs, for hatchery and natural Chinook on Catherine Creek and the Imnaha, Lostine and Upper Grande Ronde rivers. We examined these data for trends over time.

Task 11.1.7. 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

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 11.1.8. 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 (i.e., hatchery or naturally produced), 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 11.1.9. 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, by origin are determined annually for each population. These percentages are monitored for changes over time.

Task 11.1.10. 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 and/or fish/redd ratios in all surveyed streams. These numbers are monitored for changes over time.

Task 11.1.11. Collect tissue samples to provide to NOAA Fisheries for genetic analysis. Results used in studies including, but not limited to, Snake Basin Parentage-Based Tagging (PBT), investigating differences between naturally- and hatchery-produced salmon, identifying effects of hatchery supplementation, and a relative reproductive success study on Catherine Creek.

This task was completed. Samples collected from all five populations of Lookingglass Hatchery broodstock were sent to the Idaho Fish and Game Eagle Genetics Lab for analysis. Catherine Creek spawning ground samples were sent to NOAA Fisheries for genetic analysis. Spawning ground samples collected from the Lostine River by both ODFW and the Nez Perce Tribe, and from Lookingglass Creek by the Confederated Tribes of the Umatilla Indian Tribe, were sent to the Columbia River Inter-Tribal Fish Commission/University of Idaho Hagerman Genetics Lab for analysis. Samples were shared between Eagle Genetics Lab and NOAA Fisheries where appropriate.

**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 Salmon comprehensive	2015	30 Sept. 2017
Steelhead comprehensive	2015	30 Sept. 2017
Summer steelhead creel surveys	2013-15	30 Sept. 2017
Annual Data Summaries	1983-2016	31 Dec. 2017
Annual Performance Report	2016-2017	31 Dec. 2017

We completed the 2014-15 Steelhead Creel Survey report and the 2015 Annual Steelhead Progress Report in September, 2017. The 2014 Chinook comprehensive report was completed in July 2017 and the 2015 Chinook comprehensive report will be completed in January 2018. The Annual Data Summaries were submitted to the LSRCP office on schedule. However, the Annual Performance Report was completed about 2 weeks after the final report date.

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

Title	Due Date
Increased harvest of an andromous hatchery steelhead stock through return timing manipulation	30 September 2017

This manuscript was published in the June 2017 edition of *Fisheries Ecology and Management*

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