Lookingglass Creek Salmonid Evaluation Studies

U.S. Fish and Wildlife Service – Lower Snake River Compensation Plan

Performance Report for
Statement of Work
October 1, 2017 through September 30, 2018

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OVERVIEW AND BACKGROUND

Dwindling numbers of spring Chinook salmon were seen throughout the Snake River and Grande Ronde basins in the 60’s and 70’s in part as a result of construction of hydroelectric facilities, overfishing, and loss of critical habitat. The native Lookingglass Creek (LGC) stock of spring Chinook salmon was extirpated within a few years after establishment of Lookingglass Hatchery in 1982. Prior to Lookingglass Hatchery (LH) being built, LGC had the second highest number of redds in the Grande Ronde River Basin. The start-up of LH represented the beginning of large-scale hatchery intervention in the Grande Ronde River Basin, with the exceptions of the Wenaha and Minam rivers that remain wild fish only.

The LGC provides a unique study opportunity to monitor and evaluate natural production from an endemic stock versus two different hatchery reintroduction treatments. The endemic stock (Study era 1) and two hatchery-origin treatments (Study era 2, 3) in this evaluation occur in the same stream over different time periods. The study takes place within a relatively healthy watershed with reduced effect from human activities (e.g. grazing, water withdrawals, mining, and logging) common to other streams in the Basin. The current management goal is to reintroduce spring Chinook salmon into LGC using Catherine Creek stock to support natural population restoration, tributary harvest, and maintain genetic diversity of a gene bank for the Catherine Creek stock. Lookingglass Creek is within the “usual and accustomed” areas of gathering for the CTUIR.

Study Era 1: Burck (1993) studied the endemic stock from late 1963 through late 1974. The endemic population was already in decline by the early 1970’s, due to habitat degradation and several of the mainstem hydroelectric facilities being completed. Lookingglass was well suited to be a study stream, since its population was in decline, it had good water, and an existing fishway that could be easily modified to be an upstream fish ladder, (Burck, 1993). This study ended in 1974, and shortly after the Lookingglass Hatchery was built (1982) and the last of the endemic population was extirpated.

Study Era 2: The Confederated Tribes of the Umatilla Indian Reservation (CTUIR), along with other co-managers, began efforts in the early 1990s to reestablish natural production of spring Chinook salmon in LGC, using hatchery stocks. Several stocks, including remnants of the endemic stock, Carson Hatchery (Washington), and Rapid River (Idaho) were used before co-managers selected Rapid River, which were then used in the reintroduction efforts from 1992-2000 (Lofy, Carmichael, & Groberg, 1991) and (McLean & Lofy, 2000).

Study Era 3: Rapid River stock in Lookingglass was then replaced with Catherine Creek stock due to its local origin (Grande Ronde Basin), life history characteristics similar to the extirpated Lookingglass stock and surplus was readily available. Catherine Creek captive broodstock were collected as parr, hatchery-reared until maturity, and spawned. Those progeny were hatchery-reared, marked, and released in LGC as presmolts beginning in September 2001. These were the first releases into Lookingglass Creek of Catherine Creek origin. The first releases of adult to spawn naturally above the weir occurred in 2004. The
first natural-origin returns of production above the LH weir occurred as age three in 2007, age four in 2008, and age five in 2009. This study is still ongoing. This investigation reports juvenile and adult life history and production metrics. Metrics similar to Burck (1993) were contained in annual reports that can be accessed at the Lower Snake River Compensation Plan website.

The CTUIR Management Objectives are to:

1. Reestablish a naturally-reproducing, self-sustaining population of spring Chinook salmon in LGC of an average annual run size of 500 adults (ages 4 and 5) using Catherine Creek stock as the donor.
2. Provide for a minimum annual tribal harvest of 100 returning adults.
3. Retain production and life history characteristics similar to the endemic stock.

The preceding goals and objectives are consistent with the overall mission statement of the CTUIR Department of Natural Resources:

“To protect, restore, and enhance the First Foods; water, salmon, deer, cous, and huckleberry - for the perpetual cultural, economic, and sovereign benefit of the CTUIR. We will accomplish this utilizing traditional ecological and cultural knowledge and science to inform: 1) population and habitat management goals and actions; and 2) natural resource policies and regulatory mechanisms.”

The goal of the Lookingglass Creek Spring Chinook Hatchery Program is to reintroduce spring Chinook into Lookingglass Creek using the Catherine Creek stock to support tributary harvest, natural population restoration, and maintenance of a gene bank for the Catherine Creek stock (ODFW, 2016).

Program specific goals for the Lookingglass Creek program include:
1. Restore and maintain viable naturally spawning populations of Chinook salmon in Lookingglass Creek.
2. Contribute to recreational, commercial and tribal fisheries in the mainstem Columbia River consistent with agreed abundance based harvest rate schedules established in the 2008 – 2017 U.S. vs. Oregon Management Agreement.
3. Establish adequate broodstock to meet annual production goals.
4. Establish a consistent total return of Chinook salmon that meets the LSRCP mitigation goal. There are no LSRCP or Tribal Recovery Plan (TRP) hatchery and natural adult return goals identified specifically for Lookingglass Creek. However, LSRCP does have a specific spring/summer Chinook goal of 58,700 hatchery adults for the Snake River and 5,820 hatchery adults into the Grande Ronde Basin. The TRP return goal for the Grande Ronde Basin is 16,000 adults.
5. Re-establish historic tribal and recreational fisheries.
6. Minimize impacts of hatchery programs on other indigenous species.
7. Operate the hatchery program so that the genetic and life history characteristics of hatchery fish mimic those of natural fish, while achieving mitigation goals.

STUDY AREA
The LGC watershed is located in the Blue Mountains of northeast Oregon with the headwaters at an elevation of 1,484 m above sea level (Figure 1). Flow is to the southeast for 25 river km (rkm) through the Umatilla National Forest and through private land before entering the Grande Ronde River at rkm 137, at an elevation of 718 m above sea level. LGC has one major (Little LGC) and four minor (Lost Creek, Summer Creek, Eagle Creek, and Jarboe Creek) tributaries. Nearly all spring Chinook salmon spawning occurs in LGC and Little LGC. The LH is located at approximately rkm 4.0 on LGC. Access to private lands to conduct work is obtained by verbal agreement, or in the case of Hancock Properties LLC lands, an annual written agreement and fee.

Figure 1. Map of LGC watershed.

MONITORING AND EVALUATION GOALS, OBJECTIVES AND TASKS

Project Goal: Evaluate the reintroduction of spring Chinook salmon in LGC using a local in-basin Catherine Creek stock.

The CTUIR shall furnish all supervision, labor, services, materials, tools, and equipment necessary to conduct an evaluation of LSRCP programs in their ceded and usual and accustomed areas to fulfill the objectives outlined below:
1.0 **Objective 1.** Determine growth and condition factor of naturally produced juvenile spring Chinook parr in LGC and estimate seasonal outmigrant abundance, outmigration timing, survival and arrival to Lower Granite Dam.

**Approach:** We will sample outmigrating natural-origin juvenile spring Chinook salmon in order to describe life history and production characteristics.

We will snorkel/seine to collect 50 parr from the standard site at rkm 8.9 and at V and L footbridge site at rkm 10.5 on LGC to describe seasonal growth and condition (Figure 1). Genetic samples of precocial Chinook will also be taken if captured. A precocial is defined as a juvenile Chinook larger in size than typical fish, yellowish or greenish in color, and expressing milt readily.

We will target 1,000 Birth Year 2017 parr to be snorkeled or seined from the major nursery area several km above the LH weir between rkm 8.9 to 11.5 on LGC.

Outmigrant production and timing will be estimated using a 1.5 m rotary screw located trap at rkm 4.0. Unmarked fish ≥ 61 mm will receive Passive Integrated Transponder (PIT) tags (TX1411SST) following standard protocols. Marked fish will be released above the screw trap to estimate trap efficiency, and total outmigrants, and outmigration timing will be derived from those estimates. The PIT tags used for outmigrants collected in the screw trap from January 1 to June 30 will be provided by the Comparative Survival Study (CSS) project (DeHart, M, 2013). Outmigrant abundance will be estimated for each month of the migration year using DARR 2.9.1 for the R programming and statistical package (Bjorkstedt, 2005). Observations at sites in the Columbia/Snake River hydrosystem will be used to estimate survival probabilities and arrival timing to Lower Granite Dam for two seasonal groups (winter and spring). The winter group consists of presmolts leaving LGC from July-December and the spring group of smolts leaving from January-June. Goals will be to tag 700 for the fall/winter group and 700 in the spring group.

Estimates of survival and migration timing for parr PIT-tagged in early August 2017 and outmigrants PIT-tagged and released at the screw trap during July 2017-June 2018 will be made using PitPro (Westhagen & Skalski, 2009) or SURPH (Lady, Westhagen, & Skalski, 2013) and the PTAGIS database (http://www.ptagis.org/) maintained by the Pacific States Marine Fisheries Commission. Estimates of smolt equivalents will be calculated for the winter (July-December) and spring groups (January-June) of migration year 2018 by adjusting the seasonal outmigrant estimates by the survival probability to Lower Granite Dam for that period. Smolt equivalents will be used to estimate the smolt-to-adult ratio for brood year 2017 (migration year 2018). Precocals collected in the screw trap will be enumerated, measured, genetic samples taken, and weighed. Precocals will not be used in population estimates of outmigrants.

We will synthesize juvenile life history and production data from LGC spring Chinook salmon with data from other streams in the Grande Ronde and Columbia River basins. We will compare juvenile metrics to 1) determine whether we have been successful in meeting management goals, and 2) place performance of the current reintroduced stock in historical,
local, and regional contexts, including the three stock comparison (endemic [Study Era 1], Rapid River reintroduction [Study Era 2], current reintroduction [Study Era 3]). These same metrics along with survival and arrival timing to Lower Granite Dam will be compared to other Grande Ronde Basin stocks, when these data are made available by Oregon Department of Fish and Wildlife (ODFW).

Task 1.1. Deploy and check rotary screw trap every 2-3 days or more frequently if needed and enumerate, examine for marks, and interrogate for PIT tags all juveniles collected.
**Completed**

Task 1.2. Mark (PIT-tag and/or fin clip) and release 25-50 fish per week for estimating trapping efficiency.
**Completed**

Task 1.3. Collect FL and weight data from a representative sample of at least 25-50 outmigrants per week.
**Completed**

Task 1.4. PIT-tag and release at least 1,400 fish collected in the screw trap for each season of the migration year (700 for winter, 700 for spring).
**Completed – Fall = 288, winter = 710, spring = 346 (1,344 total tagged).**

Task 1.5. PIT-tag and release approximately 1,000 spring Chinook salmon parr captured by snorkel seining from several locations in the primary nursery area above the LH weir.
**Completed – 375 fish tagged**

Task 1.6. Collect and sample FL (mm) and weight (0.1 g) for 50 parr per month at the standard site at rkm 8.9 and V and L footbridge site as a control at rkm 10.5. on the 20th (+/- 5 d) of July, August and September.
**Completed**

Task 1.7. Describe migration timing out of LGC and migration timing and survival to Lower Granite Dam for fish PIT-tagged after capture at the screw trap or from field group (Tasks 1.2 and 1.5).
**Completed**

Task 1.8. Validate and upload all PIT tag data to the PTAGIS database.
**Completed**

Task 1.9. Collect life history data on precocial, natural-origin fish caught during summer parr PIT-tagging and screw trap operations (FL (mm), weight (0.1 g) as well as genetic samples.
**Completed – 2 natural origin and 2 hatchery origin**

Task 1.10. Collect water temperature data using recording thermometers at rkm 4.0 on LGC and rkm 4.5 on Little LGC.
**Completed**

Task 1.11. Perform quality control on all data collected and enter into databases developed to make data web-accessible.
**Completed**

Task 1.12. Compare life history metrics (outmigrant abundance, outmigration timing, and size, condition factor, within the three-era scenario and existing historical data sets of natural-progeny of other Grande Ronde Basin stocks.
In progress - Analysis will be reported in Annual Progress Report, March 2019

Task 1.13. Compare productivity metrics (smolts/redd,) within the three era scenario and existing historical data sets of natural-progeny from other Grande Ronde Basin stocks when these data become available.

In progress - Analysis will be reported in Annual Progress Report, March 2019

2.0 Objective 2. Determine run and spawn timing, redd distribution, sex ratio, age composition, length-at-age, and prespawning mortality of adult spring Chinook salmon in LGC.

Approach: Catherine Creek stock spring Chinook salmon (captive broodstock) were selected by co-managers as the donor stock to reintroduce the species into LGC. The initial liberation of Catherine Creek captive broodstock occurred as ad-clipped presmolts released into LGC in September 2001. Since that time, additional liberations of ad-clipped donor stock juveniles have occurred as they were available. Releases of returning donor stock adults above the LH weir to spawn naturally have occurred beginning in 2004. Additionally, some returning adults have been spawned at LH and their progeny liberated into LGC as ad-clipped juveniles.

Adults returning in 2018 will include ad-clipped hatchery-origin and unmarked progeny of adults that returned to LGC and spawned naturally.

Some returning adults collected in the adult trap at LGC will be released above the LH weir to spawn naturally in 2018. If returns to LGC are inadequate to meet natural and hatchery production goals, some returning adults captured at the Catherine Creek adult trap may also be released into LGC. Guidelines for passing fish are laid out in the Lower Snake River Fish and Wildlife Compensation Plan Grande Ronde and Imnaha Basins Annual Operation Plan 2016 (ODFW, 2016), see also Appendix A – LGC Management Guidelines.

The ODFW LH staff installs and operates the LH weir and trap, and collects data and tissues from returning adult spring Chinook salmon. The CTUIR and ODFW staff will collect data and tissues from fish destined for release above the LH weir as well as for broodstock.

In addition to the adult life history data and tissues from returning Chinook adults collected at the LH weir and trap, CTUIR will collect data on spawning ground surveys above and below the weir. Data and tissues will include FL (mm), sex, marks/tags, scales (for age determination), and opercle punches (for estimating the population spawning above the hatchery weir and provide the tissues to the Columbia River Inter Tribal Fish Commission (CRITFC) conducting the relative reproductive success study). We will obtain information on adults from the coded wire tag and PIT tag databases maintained by the Pacific States Marine Fisheries Commission and other sources (http://www.ptagis.org/).

We will synthesize adult life history and production data from LGC spring Chinook salmon
with data from other streams in the Grande Ronde and Columbia River basins. We will compare adult metrics to 1) determine whether we have been successful in meeting management goals, and 2) place performance of the current reintroduced stock in historical, local, and regional contexts, including the three era comparisons.

Task 2.1. Sample (FL, sex, marks/tags, scales, genetics samples) all spring Chinook salmon collected at the adult trap that are released above the LH weir to spawn naturally in 2018. **Completed – 154 passed above the weir.**

Task 2.2. Conduct spawning ground surveys throughout the stream once a week for 3 consecutive weeks in late August and early September 2018, enumerating redds and logging locations with GPS and collecting carcass data and tissues. **Completed – 22 surveys, 81 redds**

Task 2.3. Mount, press and age scales collected from natural-returns. **In progress – Results will be presented in Annual Report**

Task 2.4. Link carcass data and snouts and provide to ODFW for analysis. **Completed – 29 snouts sent to Clackamas**

Task 2.5. Obtain CWT ages and origin from the Regional Mark Processing Center database (www.rmpc.org). **Completed - Received data back for 25 snouts**

Task 2.6. Estimate total redds, redd distribution, fish/redd, sex ratio, age composition, run timing, spawn timing, total escapement, and length frequency of adults, and progeny- per-parent ratios for natural-origin spawners above the LH weir. **Completed**

Task 2.7. Perform quality control on all data collected and enter into CDMS or other identified databases developed for web-accessibility. **Completed**

Task 2.8. Compare adult life history metrics (run and spawn timing, redd distribution, sex ratio, age composition, length-at-age, prespawning mortality) within the three era scenario of LGC and existing historical data sets of natural-progeny of other Grande Ronde Basin stocks. **In progress – Results will be presented in Annual Report**

Task 2.9. Compare adult productivity (progeny-per-parent) among the three era scenario of LGC and existing historical data sets of natural-progeny of other Grande Ronde Basin stocks. **In progress – Results will be presented in Annual Report**

3.0 Objective 3. Assist co-managers and cooperators in completing LSRCP-related project tasks as time and budget allow.

Approach: Various tasks of this and related projects are completed more efficiently and effectively by working collaboratively with co-managers and cooperators. As time and budget allow, CTUIR will continue to provide staff and equipment assistance to co-managers and cooperators.

Task 3.1. Assist ODFW in completing spring Chinook salmon spawning ground
surveys in the Grande Ronde and Imnaha Basins.

**Completed**

Task 3.2. Assist ODFW in collecting data and tissues during spawning of spring Chinook salmon broodstock at LH.

**Completed**

Task 3.3. Assist ODFW in pretransfer sampling of juvenile spring Chinook salmon reared at LH and destined for release from Catherine Creek or Upper Grande Ronde River acclimation facilities or from LH into LGC.

**Completed**

Task 3.4 Assist ODFW in production PIT tagging at the LH in October.

**Completed**

Task 3.5. Assist ODFW in other LSRCP-related activities when CTUIR staff and equipment are available.

**Completed**

4.0 **Objective 4. Synthesize and disseminate project information.**

**Approach:** Project information will be disseminated through annual reports, peer-reviewed publications and presentations, website(s), and informal consultations and correspondence. Authorizations for take of ESA-listed fish will be obtained (bull trout through comprehensive CTUIR permit from USFWS and spring Chinook salmon and summer steelhead through LGC HGMP process) and data reported.


**Completed**

Task 4.2. Make project information and reports available over the Internet and submit for LSRCP website.

**In progress**

Task 4.3. Complete final project funding proposal, statement of work and budget for the 2018-2019 contract year by 1 September 2018.

**Completed**

Task 4.4. Report annual bull trout take to USFWS for Lower Snake River Compensation funded monitoring and evaluation activities. This is part of the annual report deliverable for the Lower Snake River Compensation Plan Office. Mark Robertson (mark_robertson@fws.gov) is the point of contact for this information and for coordination.

**In progress**

Task 4.5. Report take of spring Chinook salmon and summer steelhead in annual report.

**In progress**

**Task Schedule**

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5  BIBLIOGRAPHY


The goal of the LGC spring Chinook hatchery program is to reintroduce spring Chinook into LGC using Catherine Creek stock to support tributary harvest, natural population restoration, and maintenance of a gene bank for the Catherine Creek stock.

Current production targets for Catherine Creek and Lookingglass production, per the 2008-2017 United States v. Oregon Management Agreement are outlined in Table 1.

Table 1. LGC and Catherine Creek production outlined in Table B1 of the 2008-2017 United States v. Oregon Management Agreement.

<table>
<thead>
<tr>
<th>Release Site</th>
<th>Rearing Facility</th>
<th>Stock</th>
<th>Life Stage</th>
<th>Target Release Number</th>
<th>Primary Program Purpose</th>
<th>Funding</th>
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<tr>
<td>LGC</td>
<td>LGC/Capt Br</td>
<td>CC</td>
<td>Smolt</td>
<td>250,000</td>
<td>Fishery/Reintro</td>
<td>LSRCP/BPA</td>
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<tr>
<td>CC</td>
<td>LGC/Capt Br</td>
<td>CC</td>
<td>Smolt</td>
<td>150,000</td>
<td>Suppl/ Fishery</td>
<td>LSRCP/BPA</td>
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</tbody>
</table>

LGC=Lookingglass Creek
CC=Catherine Creek

All LGC adults arriving at the LH intake weir prior to July 4 will be ponded into the adult holding ponds. Disposition of these adults will occur in early July according to the guidelines in Table 2, and adults designated to be passed upstream will be outplanted at that time. Disposition of LGC adults arriving after July 4 will be based on the percentages outlined in Table 2. All adults passed upstream will have genetic samples taken.

Table 2. Disposition of LGC adult spring Chinook salmon arriving at the LH intake weir.

<table>
<thead>
<tr>
<th>Escapement Level</th>
<th>% Pass Above</th>
<th>% Keep for Brood</th>
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<tbody>
<tr>
<td>150</td>
<td>67</td>
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<td>300*</td>
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</table>

*if greater than 300, adjustments will be made based on brood needs. If brood need has been met, remainder to be released upstream.

An estimated 158 adults (47 natural origin and 111 hatchery origin) required to meet 250,000 smolt production level. Broodstock for the program will be collected from returns.
to either the LH weir or the Catherine Creek weir. Either conventional or captive hatchery adults may be used for brood. The goal for broodstock composition will be to incorporate 30% natural origin adults, with no more than 25% of the returning natural origin Chinook retained for brood. If a shortage of natural origin adults occurs, then additional hatchery adults will be collected to meet the brood target.