Grande Ronde Satellite Facilities O&M

Annual Report

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ABSTRACT

There was only one group of fish acclimated at the Catherine Creek Acclimation Facility in 2015. The 146,394 conventional smolts arrived at the facility on 17 March. The volitional release began on 19 March, and continued until force release on 15 April. The average size of the fish at delivery was 23.2 fish/lb. The total number of fish that were released from the acclimation facility was 146,310. The size of the fish that were forced from the facility was 18.4 fish/lb. The total mortality for the acclimation period was 84 (0.06%). There were indications of some Fish Health problems in fish examined from this group. Two of 10 (20%) mortalities had a low level of aeromonad-pseudomonad bacteria. Three of 10 (30%) had gross signs of bacterial kidney disease (BKD). These same three fish had very high BKD ELISA results ranging from 2.167 to 2.349 confirming these fish had clinical BKD. There was one fish that had a slightly elevated result of 0.275 but all others were ≤0.103 OD units.

There were two acclimation groups at the Upper Grande Ronde Acclimation Facility in 2015. Group 1, 118,445 conventional smolts, arrived at the facility on 16 March 2015. Group 2, 106,100 conventional smolts, arrived on 31 March. Volitional release for Group 1 began on 18 March with force out on 30 March (Table 6). The average size of the fish at delivery was 22.0 fish/lb. Volitional release for Group 2 began on 1 April with force out on 15 April. The average size of the fish at delivery was 20.8 fish/lb. The total number of fish that were released from the acclimation facility was 244,443 (118,357 Group 1, 106,086 Group 2). The size of the fish that were forced from the facility was 21.3 and 19.8 fish/lb, for groups 1 and 2 respectively. There were a total of 102 mortalities during acclimation. There were 88 mortalities in Group 1 (0.07%) and 14 in Group 2 (0.01%). There were indications of some Fish Health problems in fish examined from the first acclimation group. One of 10 (10%) had gross signs of BKD. This same fish also had a very high BKD ELISA result of 1.628 confirming this fish had clinical BKD; all others were ≤ 0.073 OD units.

The Catherine Creek Adult Collection Facility was put into operation on 2 March 2015. The first adult summer steelhead was captured on 13 March. A total of 292 unmarked adult summer steelhead were trapped and released from 13 March to 22 May 2015. No hatchery adults were trapped. Median arrival at the trap was the week of 1 April. The first adult spring Chinook salmon was captured in the trap on 11 May 2015. A total of 745 (680 adult and 65 jack) spring Chinook salmon were trapped from 11 May to 30 June 2015. The total catch was made up of 288 adults and 17 jacks of natural origin and 392 adults and 48 jacks of hatchery origin. A total of 465 adult (234 natural, 231 hatchery) and 27 jack (14 natural, 13 conventional) spring Chinook salmon were released above the weir to spawn naturally. Median arrival for both natural and hatchery origin adults at the trap was the week of 3 June. The broodstock collected and transported consisted of 51 unmarked and 55 conventional broodstock adults along with three natural and one conventional jack. The trap was removed from Catherine Creek on 29 July. Trap efficiency in 2015 was estimated at 98.8%.

The Upper Grande Ronde Adult Collection Facility was put into operation on 2 March 2015. The first adult summer steelhead was captured on 9 March. A total of 30 unmarked adult summer steelhead were trapped and released from 9 March to 7 June. No adipose-clipped fish were captured. Median arrival at the trap was the week of 1 April. The first adult spring Chinook salmon

was captured on 9 May 2015. A total of 980 (965 adult and 15 jack) spring Chinook salmon, were trapped from 9 May to 7 June. The total catch was made up of 200 adults and one jack of natural origin, 477 adults and 14 jacks from conventional broodstock, and 288 adults and no jacks from captive broodstock. A total of 786 adult (151 natural, 347 conventional, 288 captive) and 7 conventional jack spring Chinook salmon were released above the weir to spawn naturally. Median arrival timing for natural and conventional adults was the week of 27 May and 3 June for the captive adults. A total of 49 adults and one jack of natural origin and 129 adults and seven jacks of conventional hatchery origin were transported to LGH for broodstock. The trap and weir were removed from the upper Grande Ronde River on 7 June 2015 due to high stream temperatures (daily maximum >20 ^{o}C). Trap efficiency was estimated at 43.6% this year.

A total of 53 females, 59 males and 4 jacks were spawned from the Catherine Creek stock at LGH in 2015. The total number of green eggs collected was 233,109. There were 34,054 surplus eyed eggs outplanted to Indian Creek on 23 October 2015 between river mile 5.50 and 5.75. A total of 85 females, 90 males, and 6 jacks were spawned from the upper Grande Ronde stock in 2015. The total number of green eggs collected was 358,688. There were 34,936 surplus eyed eggs outplanted to Sheep Creek (Upper Grande Ronde River tributary) on 23 October 2015 between river mile 9.0 and 9.25. A total of 75 females, 77 males, and 6 jacks were spawned for the Lookingglass Creek program in 2015. The total number of green eggs collected was 262,782.

In 2015, EN was used for the fourth year during the ripeness sorts. The EN system was not used on the Catherine Creek stock held in the circular tank due to logistical reasons. The mean egg viability in 2015 for stocks the EN was used on was 92%, while for Catherine Creek it was 89%.

A total of two captive brood adults from the 2009 broodyear, 13 from the 2010 broodyear, and 146 from the 2011 broodyear were transported from BOH to LGH from on 3 June. This was the remainder of the captive adults and that program has been discontinued. On 12 August 2015, 120 captive brood fish were transported from Lookingglass Hatchery for outplanting into Sheep Creek (rm 9.00 to 9.25), a tributary to the Upper Grande Ronde River. There were a total of 41 mortalities at LGH. During surveys on Sheep Creek in 2015 a total of one redd was observed and no carcasses were recovered.

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INTRODUCTION

Anadromous salmonid stocks have declined in both the Grande Ronde River Basin (Lower Snake River Compensation Plan (LSRCP) Status Review Symposium 1998) and in the entire Snake River Basin (Nehlsen et al. 1991), many to the point of extinction. The Grande Ronde River Basin historically supported large populations of fall and spring Chinook (*Oncorhynchus tshawytscha*), sockeye (*O. nerka*), and coho (*O. kisutch*) salmon and steelhead trout (*O. mykiss*) (Nehlsen et al. 1991). The decline of Chinook salmon and steelhead populations and extirpation of coho and sockeye salmon in the Grande Ronde River Basin was, in part, a result of construction and operation of hydroelectric facilities, over fishing, and loss and degradation of critical spawning and rearing habitat in the Columbia and Snake River basins (Nehlsen et al. 1991).

Hatcheries were built in Oregon, Washington and Idaho under the Lower Snake River Compensation Plan (LSRCP) to compensate for losses of anadromous salmonids due to the construction and operation of the lower four Snake River dams. Lookingglass Hatchery (LGH) on Lookingglass Creek, a tributary of the Grande Ronde River, was completed under LSRCP in 1982 and has served as the main incubation and rearing site for spring Chinook salmon programs in the Grande Ronde and Imnaha rivers in Northeast Oregon. Despite these hatchery programs, natural spring Chinook populations continued to decline resulting in the National Marine Fisheries Service (NMFS) listing Snake River spring/summer Chinook salmon as "threatened" under the federal Endangered Species Act (1973) on 22 April 1992.

Continuing poor escapement levels and declining population trends indicated that Grande Ronde River basin spring Chinook salmon were in imminent danger of extinction. These continuing trends led fisheries co-managers in the basin to initiate the Grande Ronde Endemic Spring Chinook Salmon Supplementation Program (GRESCSSP) in order to prevent extinction and preserve options for use of endemic fish stocks in future artificial propagation programs. The GRESCSSP was implemented in three Grande Ronde River basin tributaries; the Lostine River, the upper Grande Ronde River, and Catherine Creek. The GRESCSSP employed two broodstock strategies utilizing captive and conventional brood sources. The captive brood programs began in 1995, with the collection of parr from the three tributary areas. As of June 2015, all the captive brood programs have now been discontinued. The conventional broodstock component of the programs began in 1997 with the collection of natural adults returning to these tributary areas.

Although LGH was available as the primary production facility for spring Chinook programs in the Grande Ronde Basin, there were never any adult or juvenile satellite facilities developed in the tributary areas that were to be supplemented. An essential part of the GRESCSSP was the construction of adult traps and juvenile acclimation facilities in these tributary areas. Weirs were installed in 1997 for the collection of adult broodstock for the conventional component of the program. Juvenile facilities were built in 2000 for acclimation of the smolts produced by the captive and conventional broodstock programs as release sites within the natural production areas of their natal streams. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) operate both the juvenile acclimation and adult trapping facilities located on Catherine Creek and the upper Grande Ronde River under this project. The Nez Perce Tribe (NPT) operate the facilities on the Lostine River under a sister project.

Hatcheries were also built in Oregon, Washington and Idaho under the LSRCP to compensate for losses of summer steelhead due to the construction and operation of the lowest four Snake River dams. Despite these harvest-driven hatchery programs, natural summer steelhead populations continued to decline as evidenced by declining counts at Lower Granite Dam since 1995 (Columbia River Data Access in Real Time, DART) and low steelhead redd counts on index streams in the Grande Ronde Basin. Because of low escapement the Snake River summer steelhead were listed as threatened under the Endangered Species Act of 1973 by the National Marine Fisheries Service (NMFS) on 18 August, 1997. Co-managers have also discontinued off-station releases of juvenile Wallowa stock (non-endemic) hatchery summer steelhead into Catherine Creek in 1998 and the upper Grande Ronde River in 1999.

Data are lacking on summer steelhead adult return numbers, stray rates, and the genetic make-up of populations that return to tributaries of the Grande Ronde River basin. The adult fish weirs in place on Catherine Creek and the upper Grande Ronde River are also used to collect data on summer steelhead populations in those areas.

METHODS

Juvenile Acclimation

The Catherine Creek Acclimation Facility (CCAF) is located at river mile (rm) 52.5 of Catherine Creek (Figure 1). Catherine Creek originates in the Wallowa Mountains and flows north to northwest entering the Grande Ronde River at rm 117. The Upper Grande Ronde Acclimation Facility (UGRAF) is located at rm 170.5 of the Grande Ronde River (Figure 1). The Grande Ronde River originates in the Elkhorn Mountains and flows north to northeast 183 rm, before entering the Snake River.

Each facility consists of 4 portable raceways lined with vinyl fabric (Figures 2 and 3). Each raceway is 86 ft long, 8 ft wide, and the water depth is kept at around 3.25 ft (2,236 ft^3). The water supply for CCAF is pumped directly from Catherine Creek into the raceways using a screened submersible pump powered by a diesel powered electrical generator. The water supply for UGRAF is diverted from the Grande Ronde River into the raceways by gravity using a screened cement intake structure located about 600 ft upstream from the raceways. For both facilities the water is drained from each raceway through an 8 inch pipe back to the river below the water intake. A 29 ft travel trailer is placed at each facility to provide onsite housing for facility operators, who provide 24 hour watch and maintenance of the facility.

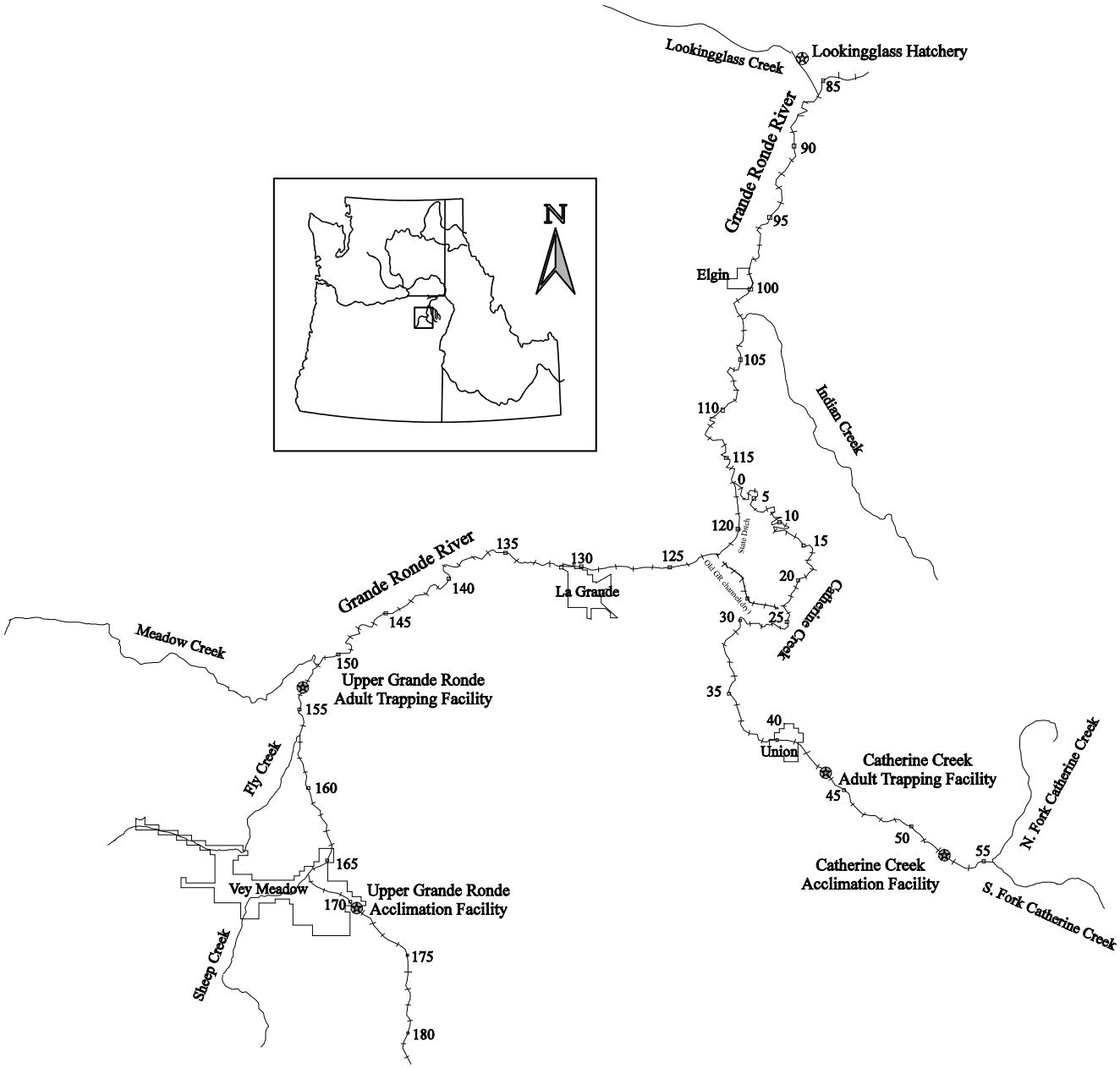

Figure 1. Map of the upper Grande Ronde River basin showing locations (rm) of Lookingglass Hatchery and Catherine Creek and Upper Grande Ronde juvenile acclimation and adult capture facilities.

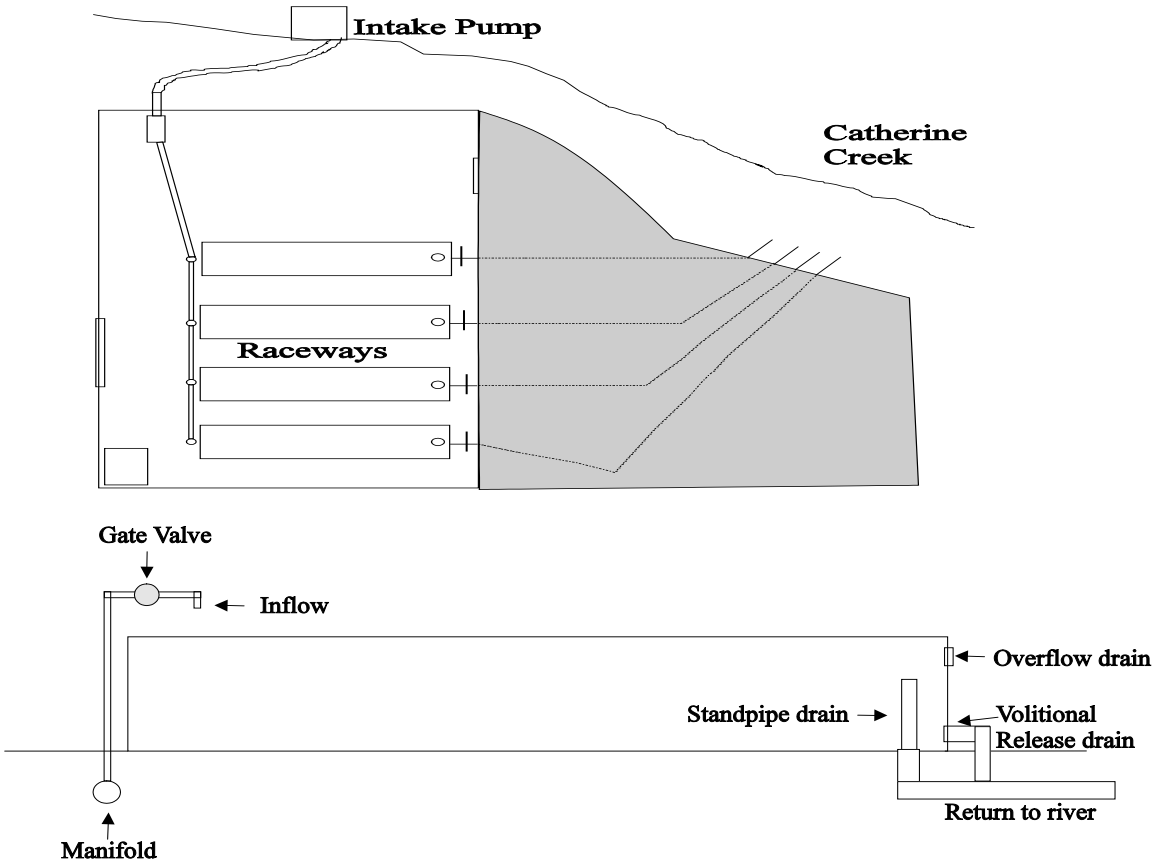

Figure 2. Photo and diagram of the Catherine Creek acclimation facility. The lines passing through the shaded area represent underground return pipes.

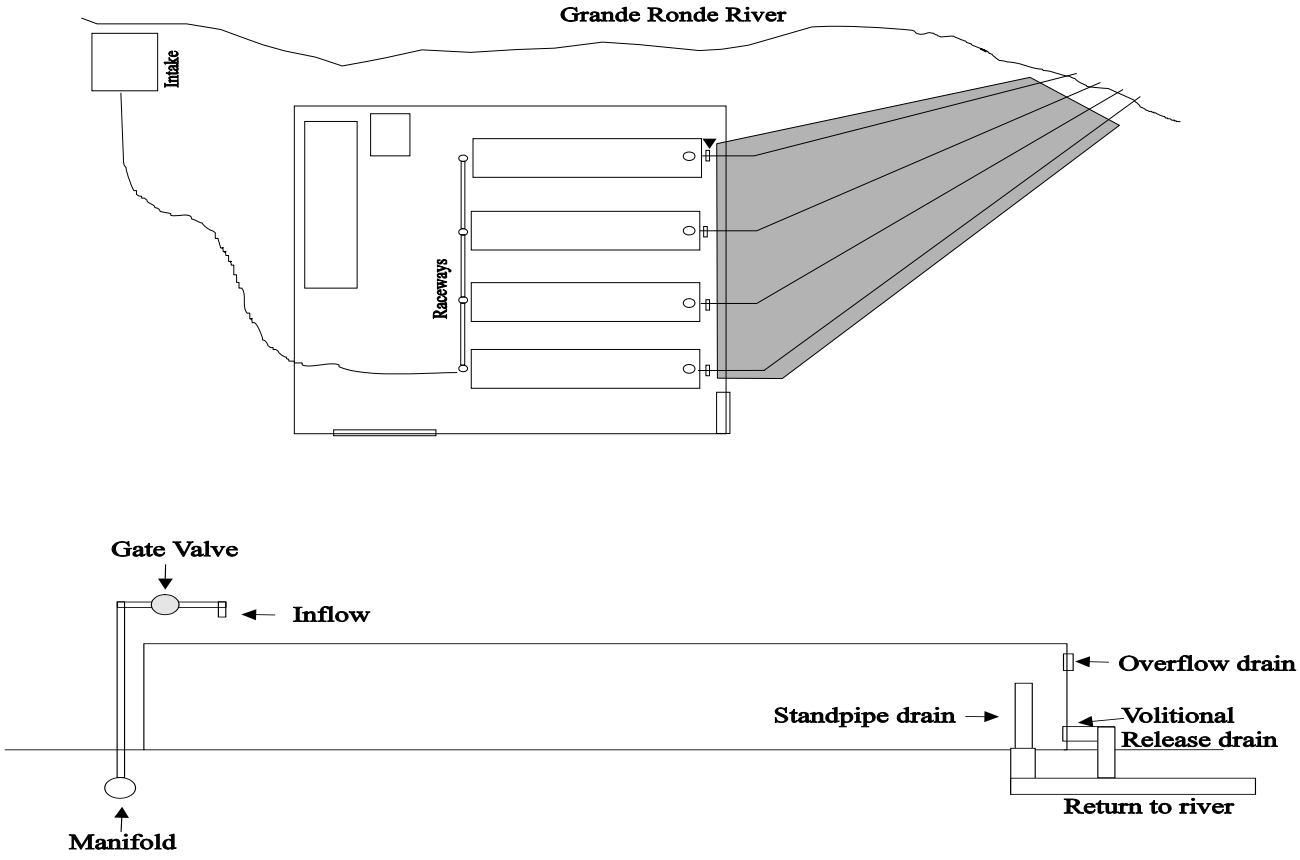

Figure 3. Photo and diagram of the Upper Grande Ronde acclimation facility. The main intake line and the lines passing through the shaded area represent underground pipes.

Each facility is designed to hold 42,475 fish per raceway at 25 fish/lb (169,900 total, 6,796 lbs), a density of 0.76 lbs/ft^3. Flow measured at the facilities has been 330 gpm/raceway, a flow density of 5.15 lbs/gpm. The production goal for Catherine Creek is 150,000 smolts. Under this scenario, there would be only one acclimation period. At the UGRAF the plan is for two acclimation periods with the production goal at 250,000 smolts. The proposed acclimation period for CCAF runs from the mid-March to mid-April. To accomplish the two acclimation periods at UGRAF, the period is split in half with the first group released at the end of March. This time period is chosen to mimic the spring outmigration timing for natural smolts in the system.

Fish are transported to the facilities from LGH by Oregon Department of Fish and Wildlife (ODFW) in tanker trucks. The fish are fed daily when water temperatures are above 3^oC at a rate ranging from 0.2 to 2.4 % body weight per day (BWD) depending on the water temperature during the acclimation period (Bio-Oregon feed rate guidelines, November 2006). Fish are fed Bio-Oregon Bio-Vita Fry 2.0 mm feed (the same feed fed at LGH). Fish are allowed to volitionally leave the raceways beginning two days after delivery to the facilities. Fish remaining in the raceways at the end of the volitional period are forced out. The fish are released in the afternoon (beginning around 1300) because flows are typically slightly higher and low light provides fish cover as they move downstream.

A portion of the fish at both facilities are tagged with passive integrated transponders (PIT) each year by ODFW and CTUIR for survival estimation to Snake and Columbia River dams. At CCAF, PIT tag detectors are installed on the volitional release drains (Figure 2) before the volitional release to monitor the outmigration for the ODFW early life history project. We no longer monitor PIT tag migration at the UGRAF. Mortalities are removed daily, scanned for PIT tags, and saved for ODFW pathology. The total number of fish released is estimated using ODFW Fish Liberation Reports and acclimation mortality records. Lengths and weights are taken at both facilities by monitoring and evaluation personnel at arrival, and just before the force out, by netting 50 fish from each raceway. Project personnel conduct maintenance and repair activities on the facility grounds and equipment as needed to operate each of the facilities.

Adult Collections

The Catherine Creek Adult Collection Facility (CCACF) is located at rm 43.5 of Catherine Creek (Figure 1). The facility consists of a hydraulic weir which is attached at the bottom sill of a full channel width pool and chute type ladder (Figure 4). Trapping of adult summer steelhead and spring Chinook salmon is accomplished by directing adults into an off channel trap with a fyke opening and holding area that is 25 ft long and 6 ft wide. The depth is operated at about 6 ft (900 ft^3). The designed adult spring Chinook salmon holding capacity for this facility is 90 using 10 ft^3/adult. There is also a recovery area in the ladder above the trap that the fish can remain in until ready to continue upstream.

The Upper Grande Ronde Adult Collection Facility (UGRACF) is located at rm 153.5 of the Grande Ronde River (Figure 1). The facility consists of a floating weir and trapbox that spans the entire stream effectively blocking upstream passage (Figure 4). Trapping of summer steelhead and spring Chinook salmon is accomplished by directing adults into the trapbox. The trapbox is located in the main channel near the bank and is 11 ft long and 10 ft wide. There are two openings in the trapbox, one in the front of the box with a fyke attached and the other a trap door on the side under the weir panels. The depth of the water in the trapbox is normally about 2.5 ft (275 ft^3). The designed adult spring Chinook salmon holding capacity for this facility is 28 using 10 ft^3/adult. There is a structure on the upstream side of the trap that reduces the flow of the river on the trap side and allows an area of recovery for the fish that are passed.

A travel trailer is placed at each facility after the completion of the acclimation periods to allow for 24 hour/7 day a week security during the peak trapping periods. Each of the traps is checked daily and water temperatures are taken with a pocket thermometer before the trap is operated. An Onset™ recording thermometer is also installed in the trap boxes for hourly temperature readings. Handling events only occur when water temperatures are below 20.0^{o}C. Later in the season, as water temperatures rise, fish are processed earlier in the day when water temperatures are lower, in order to reduce stress. At the upper Grande Ronde facility, if and when the daily maximum water temperature exceeds 20.0^{o}C the trap is opened and the weir is removed from the stream for the year (2015 LSRCP AOP).

Drug free methods are used at the traps due to possible harvest of the fish above the weirs. Electro-narcosis (EN) was used during trap checks at Catherine Creek to sedate the fish prior to handling. The EN system consists of a 75 gallon trough with an 18 in. x 18 in. aluminum plate attached at each end of the trough. The plates are covered with a plastic mesh to eliminate contact of the fish with the plates. The plates are wired to the power system which was a variable 0 – 60 volt; 3 amp DC power source. Electro-narcosis was not used at the Grande Ronde due to safety concerns specific to that trap. A solution to this situation is being worked on so EN can be used at this site as well. The fish were worked un-anesthetized again due to the harvest concerns above the trap.

Figure 4. Photos of the Catherine Creek (top) and the Upper Grande Ronde (bottom) adult broodstock collection facilities.

Fork lengths from both summer steelhead and spring Chinook salmon are measured to the nearest millimeter (mm). A paper punch is used to mark fish and collect tissues for genetic samples. A single punch on the right opercle plate is used to mark the fish that are released upriver as having been trapped. Tissue from opercle punch is collected for genetics evaluation (all steelhead, and only Chinook from CCACF). Tissue samples are stored dry in scale envelopes. Each fish is examined externally for marks, injuries or other physical conditions, and a preliminary determination of sex is made. Scales from a subsample of the steelhead and all natural Chinook are taken. Naturally and hatchery produced summer steelhead are enumerated and passed upstream. Spring Chinook salmon are collected and transported to LGH for broodstock, outplanted in another stream, or enumerated and passed upstream. Summer steelhead kelts encountered are counted and allowed to pass downstream over the weir if alive and sampled (length, weight, and otolith) if dead. Any spring Chinook salmon mortality recovered is also sampled. Fish species captured incidentally are released upstream.

Spring Chinook broodstock collection at the CCACF is based on a sliding scale developed by co-managers in the basin (Appendix Table 1). The sliding scale was developed to allow for increases and decreases in the number of returning naturally- and hatchery-produced fish and to provide a basin specific approach to broodstock and natural escapement management. The scale is based on preseason population estimates and regulates the percentage of natural and hatchery broodstock to be retained and hatchery/wild ratio above the weir. When the ratio is applied above the weir and surplus fish are the result, these fish can be used for Lookingglass Creek broodstock or outplanted in Lookingglass Creek and/or Indian Creek. Fish collected for broodstock are taken systematically (adult/jack) from across the run. This was the last year of returns for the captive broodstock program. Progeny from the captive broodstock program are not to be incorporated into the Catherine Creek conventional hatchery broodstock but may be used for broodstock in the Lookingglass Creek program.

This sliding scale management does not apply to the UGRACF. For the upper Grande Ronde River, escapement and broodstock collection guidelines were agreed to by the co-managers as part of the Grande Ronde Spring Chinook Hatchery Management Plan (GRSCHMP 2002). Up to 50% of the natural fish returning to the weir may be retained for brood and as many conventional origin adults as needed to meet the broodstock goal. No captive brood progeny adults are used for broodstock. There are no restrictions on hatchery/wild ratio above the weir. Fish collected for broodstock are to be taken systematically (adult/jack) from across the run. However, due to temperature concerns in the upper Grande Ronde, a contingency collection schedule is developed and agreed to as part of the LSRCP Annual Operating Plan (AOP) in case of early, high temperature conditions.

Hatchery jack management above the weirs is the same for both Catherine Creek and the upper Grande Ronde River. The goal is not to exceed a total of one jack for every ten adult male spring Chinook passed (10%). However, all natural origin jacks are passed upriver regardless of number. If natural jack numbers are below the 10% male level, then enough conventional jacks are released to meet the target. Surplus jacks that arrive at the weirs are sacrificed for data collection (coded wire tag) and distributed for ceremonial and subsistence uses. Preferred jack management in the Catherine Creek broodstock is 1 jack for every 10 males (10%) while the Grande Ronde broodstock can be as high as 1 jack for every 5 adult fish. The high percentage allowed in the

Grande Ronde broodstock is due to the historical very low adult numbers when the GRSCHMP was being developed and the possible need for more males in the brood. Generally the same rate (1:10) is used as for the Catherine Creek brood.

All fish collected for broodstock at UGRACF and CCACF and transported to LGH received prophylactic dorsal sinus injections of oxytetracycline and tulathromycin (Draxxin) upon loading. Dosage of each antibiotic is based on estimated age length data (3 year fish <600mm, 4 year fish 600-799mm, 5 year fish >799). For the tulathromycin injection (100mg/ml), 3-year-old fish received 0.50cc, 4-year-old fish 1.0cc, and 5-year-old fish 2.0cc. The oxytetracycline (200mg/ml) is given at one-quarter the dose of the erythromycin injections.

The fish are transferred from the trap to the CTUIR transport vehicle by using a water-filled tube. Broodstock are transported from each weir site to LGH using 300 gallon fiberglass tanks mounted on flatbed trailers. The tanks are each equipped with an aerator and oxygen tank. Transport time to LGH from the weir sites is about 1.0 to 1.5 hours. Target dissolved oxygen level in the tank during transport is 11 mg/l. Dissolved oxygen levels are checked mid-way through the transport.

The possible effects of the weirs on fish behavior is evaluated by walking or snorkeling a one-mile segment of the stream immediately downstream of the weirs once a week when water levels and clarity allow for viewing fish. Live fish, carcasses, and evidence of spawning activities (redds, test digs) are recorded. ODFW and CTUIR staff conducts standard spawning ground surveys (Monzyk et al. 2006) on segments upstream and downstream of the weir in August and September and the same information is collected.

Project personnel conduct maintenance and repair activities on facility grounds and equipment as needed to operate the facilities.

Broodstock Activities

Assistance is provided to ODFW for the spawning of the Lookingglass Creek, Catherine Creek and Upper Grande Ronde River conventional broodstocks held at LGH. All stocks at LGH are checked for ripeness once a week over a five week period beginning around the middle of August. At BOH, a maturity sort is conducted at the end of May. Maturing captive brood are then trucked to LGH in late May or early June. If production from the conventional program is anticipated to be 150,000 smolts or more in a given year, mature captive brood adults will be outplanted into Meadow and/or Sheep Creek. If less than 150,000 smolt production from the conventional program is anticipated in a given year, all mature captive brood adults will be spawned. Enough eggs will be retained and reared to smolt in order to maintain a total release program of 150,000 (conventional + captive). The remaining SNAP eggs will be outplanted into Meadow and/or Sheep Creek.

RESULTS AND DISCUSSION

Juvenile Acclimation

There was only one group of fish acclimated at the CCAF in 2015 (Table 1). The CCAF received 146,394 conventional smolts on 17 March. The volitional release began on 19 March, and continued until force release on 15 April. The average size of the fish at delivery was 23.2 fish/lb (Table 2). Densities in the raceways ranged from 0.69 to 0.73 lbs/ft^3. The variability in the raceway densities was due to the densities at LGH and the way they were loaded onto the transport truck.

The total number of fish that were released from the acclimation facility was 146,310. The size of the fish that were forced from the facility was 18.4 fish/lb. Based on the size of the fish at delivery it appears that the smaller fish left the raceways volitionally leaving the larger fish to be forced out. This was the opposite of what we have seen in the past where the larger fish leave the pond volitionally. The increased size of the fish left for force out could also be due to growth of the fish during the acclimation period as evidenced by the increased amount of feed fed from previous years (Appendix Table 2). The estimated release size for the entire group was 20.8 fish/lb. A total of 619.5 pounds of food was fed during the acclimation period. The average daily water temperature at the adult site ranged from 1.2^{o}C to 8.0 ^{o}C during the acclimation period (Figure 5).

The total mortality for the acclimation period was 84 (0.06%). There were indications of some Fish Health problems in fish examined from this group. ODFW Fish Health Services examined a total of 10 Catherine Creek smolt mortalities. These represented fish from raceways 2 and 3 at Lookingglass Hatchery. Two of 10 (20%) mortalities had a low level of aeromonad-pseudomonad (APS) bacteria. Three of 10 (30%) had gross signs of BKD. These same three fish had very high BKD ELISA results ranging from 2.167 to 2.349 confirming these fish had clinical BKD. There was one fish that had a slightly elevated result of 0.275 but all others were ≤0.103 OD units. All samples collected for virus culture were negative.

Table 1. Raceway fish density and flow data for the Catherine Creek acclimation facility release in 2015.

Program	Mark	LFH raceway	CCAF raceway	No. Fish	Arr.Size (f/lb)	Wt. (lbs)	lbs/gpm	lbs/cf	Mortality
Conv.	AD,CWT	2	1	36,123	22.8	1,584	4.80	0.71	12
Conv.	AD,CWT	2	2	36,123	23.2	1,556	4.71	0.70	26
Conv.	AD,CWT	3	3	37,074	24.1	1,538	4.66	0.69	17
Conv.	AD,CWT	3	4	37,074	22.8	1,627	4.93	0.73	29
			Totals	146,394	23.2	6,306			84

Table 2. Group, number, size, raceways, mortality, feed fed, and numbers released from the Catherine Creek acclimation facility in 2015.

Facility/ rel. yr	Group	Number Received	Rel.Size fish/lb.	Raceways used	Density lbs/ft^3	Total mortality (%)	Feed Fed (lbs)	Number released
CC 15	1 Conv.	146,394	20.8	4	0.71	0.06	619.5	146,310

Table 3. Group, acclimation dates, temperature, and dissolved oxygen for the acclimation period at the Catherine Creek acclimation facility in 2015.

Facility/ rel. yr	Group	Acclimation Period	Volitional began	Temp.^{o}C		DO mg/l	
				Min.	Max.	Min.	Max.
CC 15	1 Conv.	3/17 – 4/15	3/19	1.2	8.0	8.4	13.4

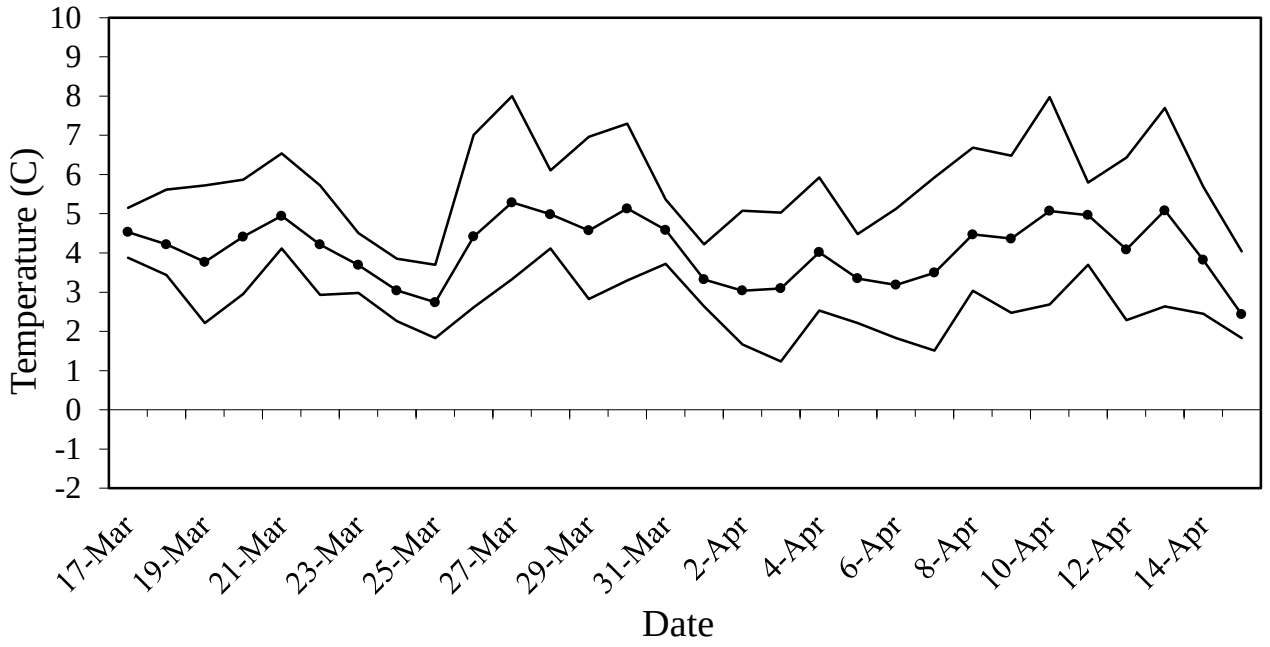

Figure 5. Daily maximum, minimum, and average water temperatures (recorded hourly) at the Catherine Creek juvenile acclimation facility in 2015.

There were two acclimation groups at the UGRAF in 2015 (Table 4). Group 1, 118,445 conventional smolts, arrived at the facility on 16 March 2015. Group 2, 106,100 conventional smolts, arrived on 31 March (Table 5). Volitional release for Group 1 began on 18 March with force out on 30 March (Table 6). The average size of the fish at delivery was 22.0 fish/lb. The densities in the raceways were 0.60 and 0.61 lbs/ft^3. Volitional release for Group 2 began on 1 April with force out on 15 April. The average size of the fish at delivery was 20.8 fish/lb. The densities in the raceways ranged from 0.54 to 0.60 lbs/ft^3.

The total number of fish that were released from the acclimation facility was 244,443 (118,357 Group 1, 106,086 Group 2). The size of the fish that were forced from the facility was 21.3 and 19.8 fish/lb, for groups 1 and 2 respectively. Based on the size of the fish at delivery it appears that the larger fish from Group 1 left the raceways volitionally leaving the smaller fish to be forced out while for Group 2 the fish remaining were larger indicating that the smaller fish may have left volitionally. The usual pattern seen in the past has been for the larger fish to leave the facility first. Growth of the fish for the acclimation period is probably not a reason for the larger size at release as the fish are only in the ponds for a couple of weeks. The estimated release size for the entire group was 21.7 fish/lb Group 1 and 20.3 fish/lb Group 2. A total of 504.8 pounds of food was fed during the acclimation period (270.7 early, 234.1 late). The average daily water temperature at UGRAF for the acclimation ranged from -0.1^{o}C to 7.0 ^{o}C (Figure 7).

There were a total of 102 mortalities during acclimation. There were 88 mortalities in Group 1 (0.07%) and 14 in Group 2 (0.01%). There were indications of some Fish Health problems in fish examined from the first acclimation group. No fish were submitted for examination from the second group. ODFW Fish Health Services examined a total of 10 Grande Ronde smolt mortalities with dates of mortality ranging from 17 March to 29 March. These represented fish from raceways 17 and 18 at Lookingglass Hatchery. No significant levels of systemic bacteria were detected by culture. One of 10 (10%) had gross signs of BKD. This same fish also had a very high BKD ELISA result of 1.628 confirming this fish had clinical BKD; all others were ≤ 0.073 OD units. All samples collected for virus culture were negative. It is worth mentioning that raceway 18 at Lookingglass Hatchery had some low level infectious hematopoietic necrosis virus (IHNV) related loss prior to transfer to acclimation, though no virus was detected from the acclimation site mortalities that were frozen and saved for Fish Health examinations.

Maintenance and repair activities were conducted at both acclimation facilities in 2015. Facility maintenance work at the CCAF consisted of snow removal, work on the intake site, and fence repair. Facility maintenance work at the UGRAF consisted of snow removal and removal of gravel from intake area.

Table 4. Raceway fish density and flow data for the Upper Grande Ronde acclimation facility release in 2015.

Program	Mark	LFH raceway	UGRAF raceway	No. Fish	Arr Size (f/lb)	Wt. (lbs)	lbs/gpm	lbs/cf	Mortality
Group 1									
Conv.	AD,CWT	17	1	27,456	20.5	1,343	4.07	0.60	4
Conv.	AD,CWT	17	2	27,457	20.6	1,334	4.04	0.60	11
Conv.	CWT	18	3	31,766	23.8	1,338	4.05	0.60	33
Conv.	CWT	18	4	31,766	23.2	1,368	4.15	0.61	40
			Totals	118,445	22.0	5,382			88
Group 2									
Conv.	CWT	15	1	26,993	20.1	1,345	4.08	0.60	3
Conv.	CWT	15	2	26,993	21.9	1,235	3.74	0.55	4
Conv.	AD,CWT	16	3	26,057	19.4	1,342	4.07	0.60	3
Conv.	AD,CWT	16	4	26,057	21.7	1,200	3.64	0.54	4
			Totals	106,100	20.8	5,122			14

Table 5. Group, number, size, raceways, mortality, feed fed, and numbers released from the Upper Grande Ronde acclimation facility in 2015.

Facility/ rel. yr	Group	Number Received	Size fish/lb.	Raceways used	Density lbs/ft^3	Total mortality (%)	Feed Fed (lbs)	Number released
GR 15	1 Conv.	118,445	22.0	4	0.60	0.02	270.7	118,357
GR 15	2 Conv.	106,100	20.8	4	0.60	0.02	234.1	106,086

Table 6. Group, acclimation dates, temperature, and dissolved oxygen for fish acclimated at the Upper Grande Ronde facility in 2015.

Facility/ rel. yr	Group	Acclimation Period	Volitional began	Temp.^{o}C		DO mg/l	
				Min.	Max.	Min.	Max.
GR 15	1 Conv.	3/16 – 3/30	3/18	0.2	7.0	9.7	11.8
GR 15	2 Conv.	3/31 – 4/15	4/1	-0.1	6.8	9.7	12.2

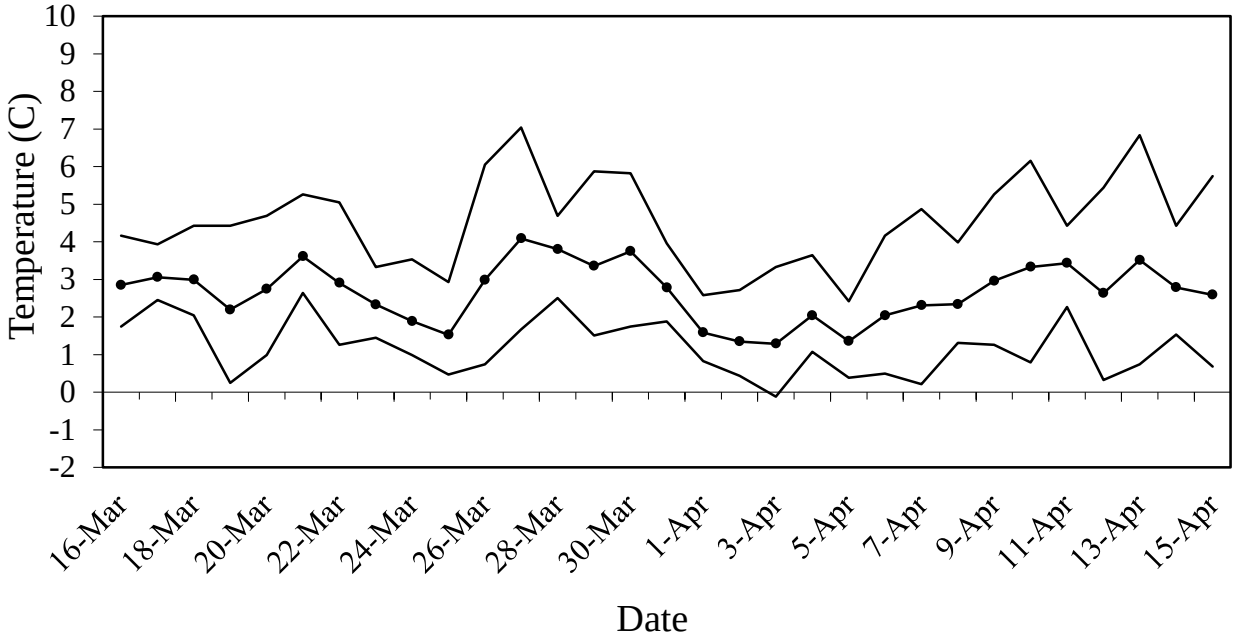

Figure 6. Daily maximum, minimum, and average water temperatures (recorded hourly) at the Upper Grande Ronde juvenile acclimation facility in 2015.

Adult Collections

The CCACF was put into operation on 2 March 2015. The first adult summer steelhead was captured on 13 March. A total of 292 unmarked adult summer steelhead were trapped and released from 13 March to 22 May 2015 (Table 7). No hatchery adults were trapped. Median arrival at the trap was the week of 1 April (Figure 7). Eleven previously trapped fish, as indicated by the presence of an opercle mark, were re-trapped and released, and seven previously trapped kelts were recovered dead on the weir.

The first adult spring Chinook salmon was captured in the trap at CCACF on 11 May 2015. A total of 745 (680 adult and 65 jack) spring Chinook salmon were trapped from 11 May to 30 June 2015 (Table 8). The total catch was made up of 288 adults and 17 jacks of natural origin and 392 adults and 48 jacks of hatchery origin. A total of 465 adult (234 natural, 231 hatchery) and 27 jack (14 natural, 13 conventional) spring Chinook salmon were released above the weir to spawn naturally. Median arrival for both natural and hatchery origin adults at the trap was the week of 3 June (Figure 8). By the week of 17 June, over 90% of both natural and hatchery adults had been trapped. This was two weeks earlier than the mean timing for the 2002 to 2014 run years. The median arrival for jacks was the week of 10 June for both natural and hatchery fish. Three fish were recaptured and passed above the weir. There were a total of seven mortalities recovered in the trap in 2015 (4 hatchery and 3 natural adults). This was the highest total mortality at the trap since we began operation in 1997 (Appendix Table 9). Upon examination of the trap mortality by fish pathology, no cause of death could be found. Ten recaptured carcasses were recovered on the weir. Most of the mortalities recovered on the weir were covered with head fungus.

Table 7. Summer steelhead trap capture data from the Catherine Creek adult collection facility in 2015. Trapping began 2 March and ended 29 July.

	Trap capture		Kelt[a]	
Week	First time	Reruns	Not punched	Punched
4-Mar	0			
11-Mar	0			
18-Mar	69	1		
25-Mar	29	1		
1-Apr	50	2		
8-Apr	8			1
15-Apr	25	2		
22-Apr	41	1		
29-Apr	37	2		
6-May	23	2		1
13-May	7			1
20-May	2			3
27-May	1			1
3-Jun	0			
10-Jun	0			
	292	11	0	7

[a] *These fish were kelts recovered on or near the weir that were not previously opercle punched at the weir. Punched fish were previously trapped then recovered as a kelt carcass on or near the weir.*

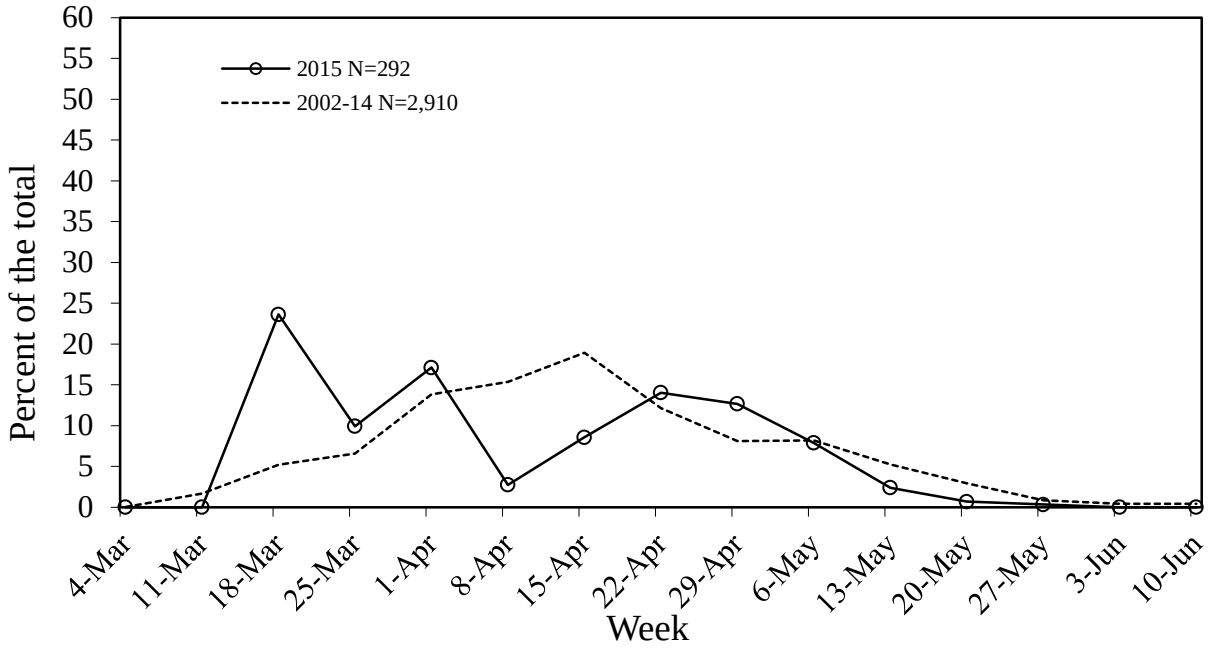

Figure 7. Summer steelhead arrival timing at the Catherine Creek adult collection facility in 2015 and mean arrival timing from 2002 to 2014.

Table 8. Spring Chinook salmon trap capture, transport, and mortality data for the Catherine Creek stock at the adult collection facility in 2015. Trapping began 2 March and ended 29 July.

	Trap capture[a]						Broodstock hauled				Trap
Week	Nat.	(jack)	Capt.	(jack)	Conv.	(jack)	Nat.	(jack)	Conv.	(jack)	mort
13-May	1		Program	Program	1						
20-May	40		finished	finished	26		6		4		
27-May	84				116	1	11		4		3
3-Jun	71	5			138	2	24	3	15	1	1
10-Jun	61	9			72	28	9		22		3
17-Jun	19	2			31	15	1		10		
24-Jun	10	1			7	1					
1-Jul	2				1	1					
8-Jul	0				0						
15-Jul	0				0						
22-Jul	0				0						
29-Jul	0				0						
	288	17	0	0	392	48	51	3	55	1	7

[a] *Age 4 and 5 spring Chinook salmon(age 3 fish). Nat. = Naturally-produced, Capt. = Captive broodstock program, Conv. = Conventional broodstock program.*

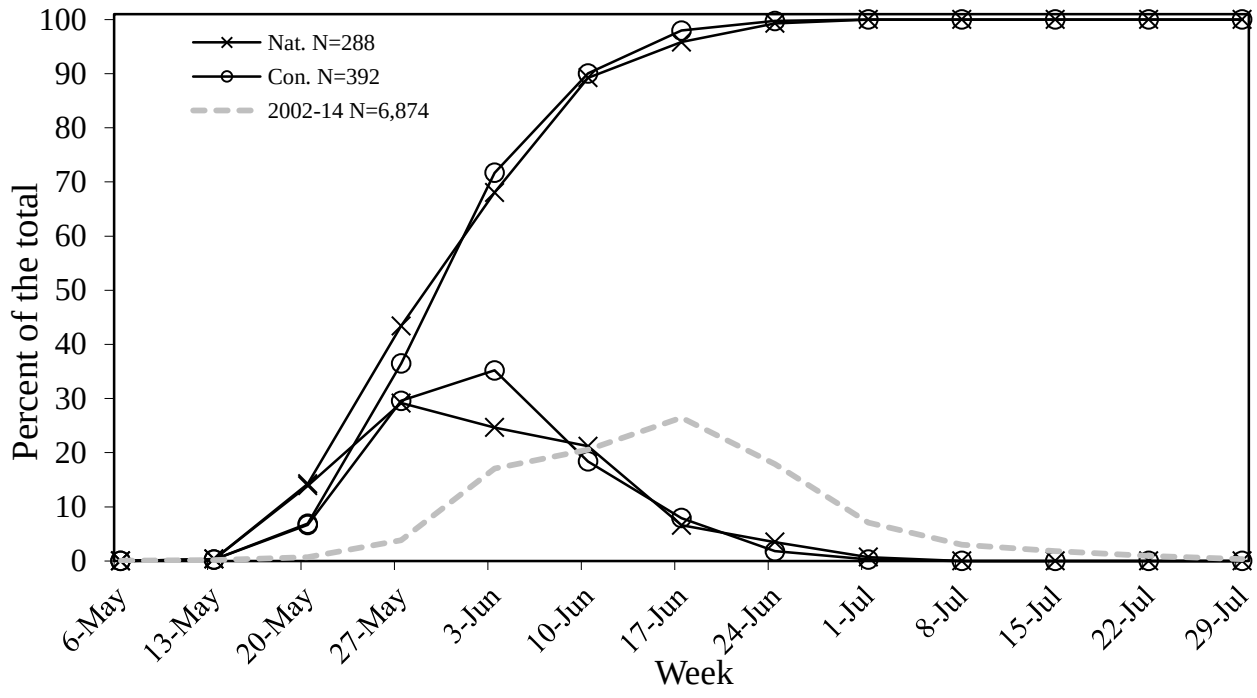

Figure 8. Arrival timing of age 4 and 5 spring Chinook salmon at the Catherine Creek adult collection facility in 2015 and mean arrival timing from 2002 to 2014.

The sliding scale management plan (Appendix Table 1) is a tool used to determine spring Chinook salmon disposition in Catherine Creek. There are, however, some concerns with the implementation of the scale and its application to Catherine Creek as discussed in McLean et al. 2004 and 2005. Weir management decisions regarding broodstock collection percentages and wild:hatchery escapement ratios are made using preseason forecasts and total returns to the tributary. There is substantial error associated with these forecasts which can change these percentages or ratios during the return. It is difficult to make mid-season changes without seriously affecting the cross section of the run collected for brood or released above the weir.

The predicted adult spring Chinook salmon return to Catherine Creek for 2015 was 792 (444 natural + 348 hatchery). Based on these predictions the sliding scale called for retaining ≤20% of the adult returning natural population for broodstock. Since the predicted total return was more than 500 fish, the percent of adults released above the weir that can be of hatchery origin should be less than or equal to 50%. Adults that are not passed above the weir or taken for Catherine Creek broodstock have three possible dispositions: transported to Lookingglass Creek for a fishery/natural spawning, taken as broodstock for the Lookingglass Creek program, or outplanted into Indian Creek for natural spawning. The actual natural adult return trapped was 288 fish which was 64.9% of the original predicted number and the actual hatchery adult return trapped was 392 fish which was 112.6% of the original predicted number. The hatchery percentage of adult fish released above the weir in 2015 was 49.7%. There were 27 jacks released above the weir and 199 adult males (13.6% jacks). Fourteen of the twenty seven jacks released above the weir were natural fish. Due to the larger hatchery return and to maintain the 50:50 hatchery:wild ratio above the weir, a total of 100 hatchery adults and six hatchery jacks were outplanted to Indian Creek (rivermile 4.50) and two hatchery adults were outplanted to Lookingglass Creek below the hatchery (rivermile 1.50).

The broodstock collection goal for 2015 was 106 adults (75 natural, 31 hatchery) and four jacks (3 natural and 1 hatchery). The broodstock collected and transported from CCACF consisted of 51 unmarked (17.7% of the natural return trapped) and 55 conventional broodstock adults (14.0% of the hatchery return) along with three natural and one conventional jack. Broodstock were collected systematically over the entire return from 15 May to 12 June. The 2015 AOP called for the adult broodstock to be made up of 71% natural origin fish. The unmarked portion in the broodstock ended up at 48.1%. The natural portion of the broodstock was below the predicted collection goal of 71% due to the lower than expected natural return.

Gender classification of adults at spawning was compared to that at the weir to estimate the accuracy of sex determination. Accuracy was 97.9% (109/110). The fish that was missed was called a male at the weir so there was one more female in the broodstock than what was said to be collected.

The EN unit was operated for the fourth year at the CCACF in 2015. The unit performed well and did not appear to injure the fish (no mortalities in the recovery area). The incidence of mortality at the hatchery was 3.6% compared to 13.5% and 4.7% for 2013 and 2014 respectively.

The trap was removed from Catherine Creek on 29 July. Surveys conducted by ODFW in 2015 resulted in 215 redds counted above the weir and seven redds below the weir. Before the weir was in use, the average percent of the total redds located in the area below where the weir now sits was 4.6% (in years when there were >49 total redds). Based on the percentage of redds below the weir (3.1%) there did not appear to be any weir effect. A total of 86 adult carcasses were recovered above the weir which was 18.5% of the total adults passed (465). Of the 86 carcasses recovered, 85 were punched fish resulting in a trap efficiency of 98.8%. The population estimate above the weir in 2015 was 471 adult fish (2015 Spawning Ground Survey Results, ODFW, unpublished).

The duration of the high spring runoff in 2015 began dropping off about 2 weeks earlier than the 5 year average maximum (Figure 9). This early flow may have accounted for the earlier run timing observed. Hourly water temperatures were taken at the CCACF in 2015 (Figures 10 and 11). Water temperatures ranged from 1.7°C on 3 April to 25.9°C on 30 June. Lowest temperature usually occurred around 0800 with the peak temperature around 1700. The period of low water temperature set the time of day that the trap was checked and the fish worked up. Average temperature was higher than the average of the previous five years.

Maintenance work conducted at the CCACF in 2015 consisted of hydraulic weir component maintenance, rebuild of damaged sections of the weir, and weed abatement.

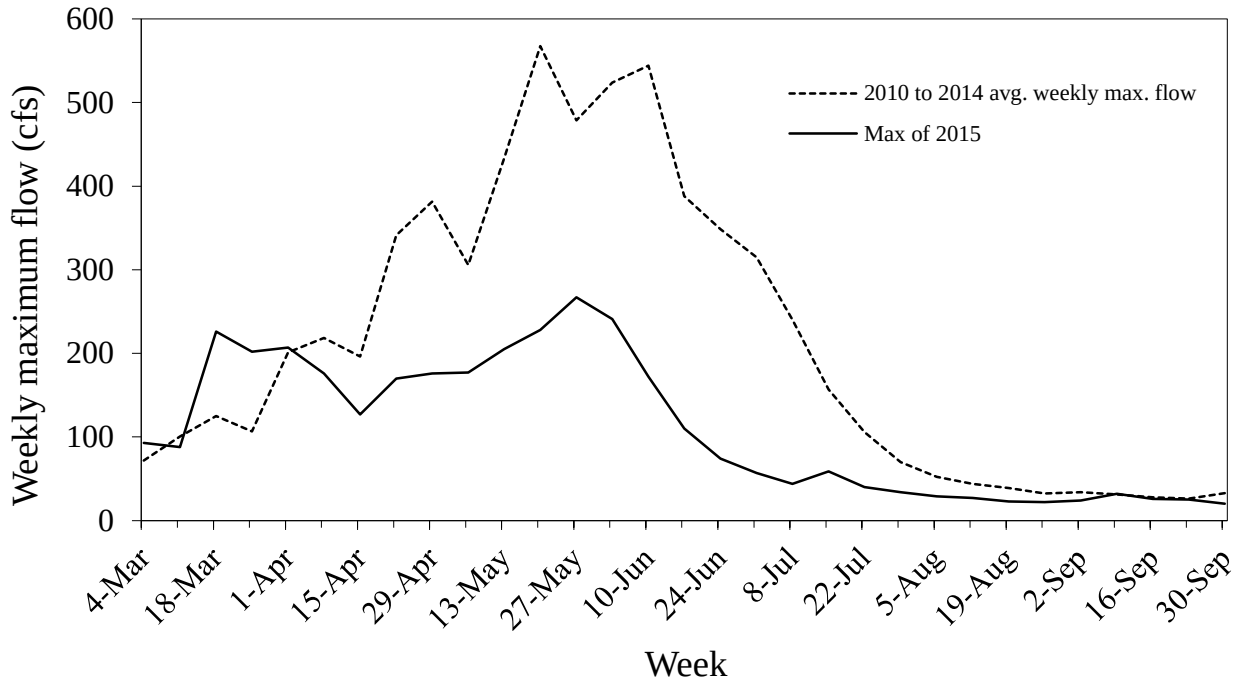

Figure 9. Weekly maximum flows (recorded daily) near the town of Union, OR in 2015(data from Oregon Water Resources Department (OWRD) website). Also shown is the mean weekly maximum flow for 2010 to 2014.

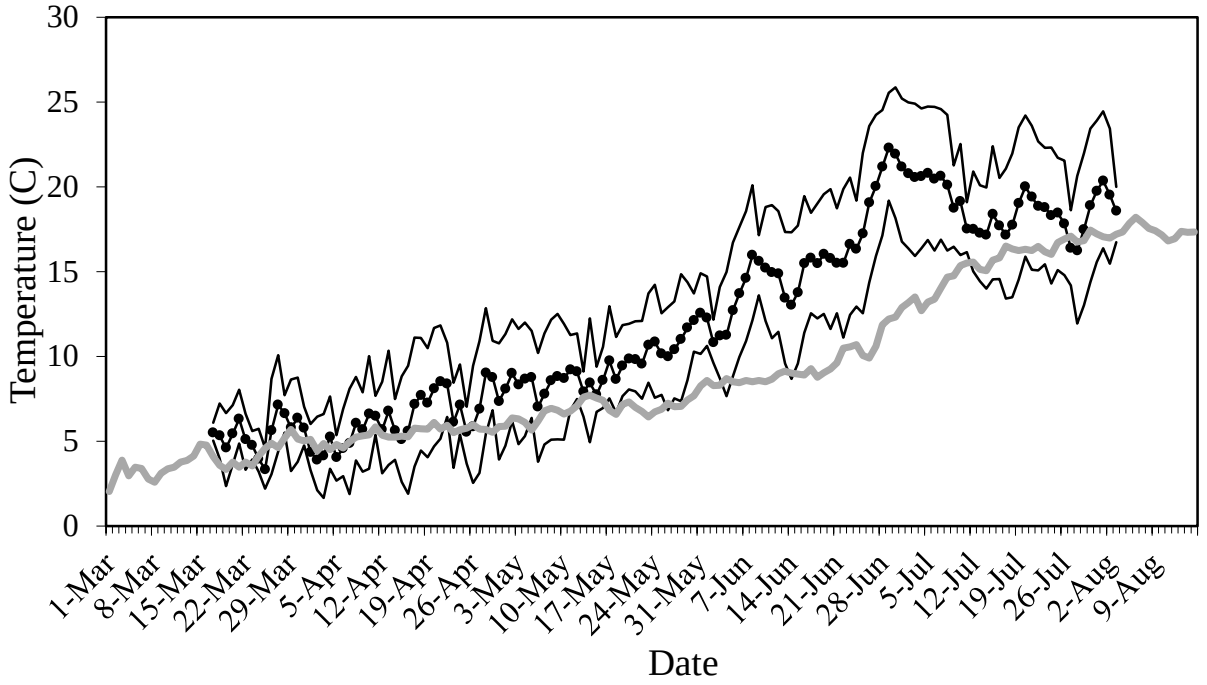

Figure 10. Daily maximum, minimum, and average water temperatures (recorded hourly) at the Catherine Creek adult collection facility in 2015. The grey line is the average temperature from 2010-2014.

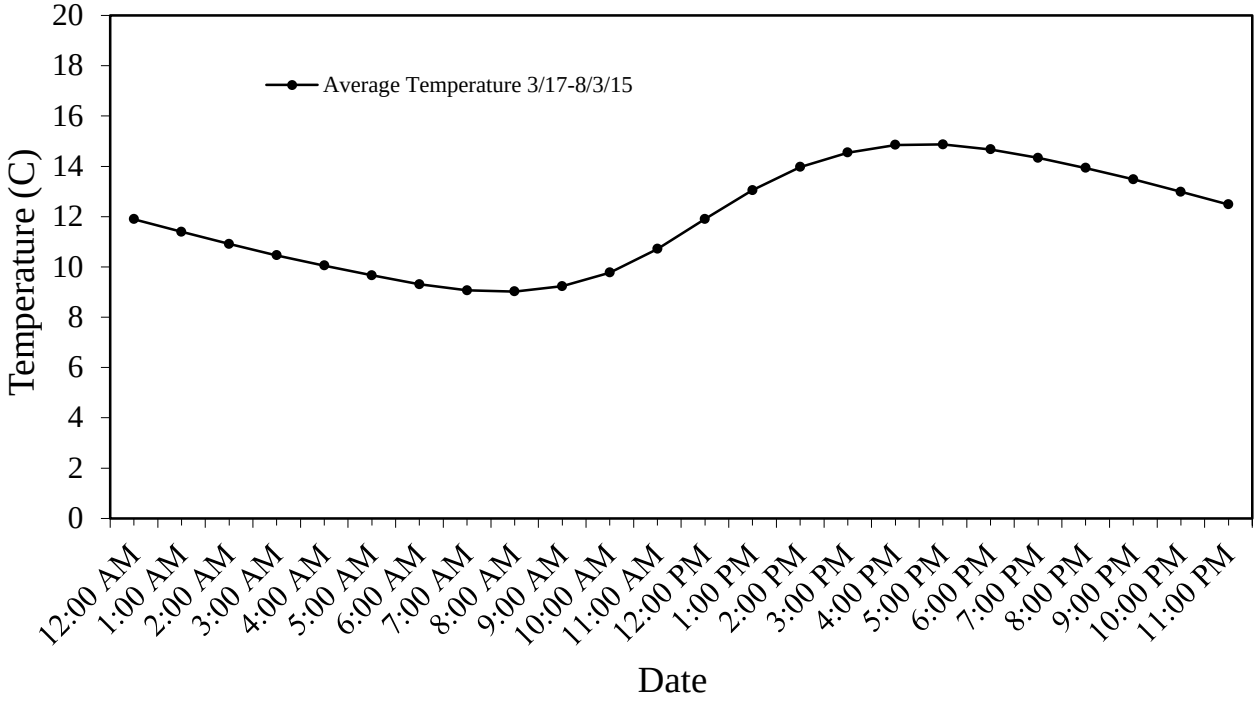

Figure 11. Average hourly water temperature at the Catherine Creek adult collection facility in 2015.

The UGRACF was moved ten miles downstream after the 2006 trapping season. There are about ten miles of spawning habitat located below the old weir location that were being utilized by returning fish. By moving the trap downstream below this spawning habitat, a more representative sample of the entire population could be trapped.

The UGRACF was put into operation on 2 March 2015. The first adult summer steelhead was captured on 9 March. A total of 30 unmarked adult summer steelhead were trapped and released from 9 March to 7 June (Table 9, Figure 12). No adipose-clipped fish were captured. Median arrival at the trap was the week of 1 April. There were 18 kelts that were passed over the weir alive (2 of which were recaptures). There were 15 kelts that were recovered dead on the weir (2 of which were recaptures).

Table 9. Summer steelhead trap capture data from the Upper Grande Ronde adult collection facility in 2015. Trapping began 2 March and ended 7 June. The trap was pulled on 7 June due to high water temperature.

	Trap capture		Kelt[a]	
Week	First time	Reruns	Not punched	Punched
4-Mar	0			
11-Mar	2			
18-Mar	6			
25-Mar	2			
1-Apr	8			
8-Apr	2			
15-Apr	0			
22-Apr	4		1	
29-Apr	0		4	1
6-May	2		6	
13-May	2		8	2
20-May	1		9	1
27-May	0	1	1	
3-Jun	0			
10-Jun	1			
	30	1	29	4

[a] *These fish are kelts recovered on or near the weir that were not previously opercle punched at the weir. Punched fish were previously trapped then recovered as a kelt carcass on or near the weir.*

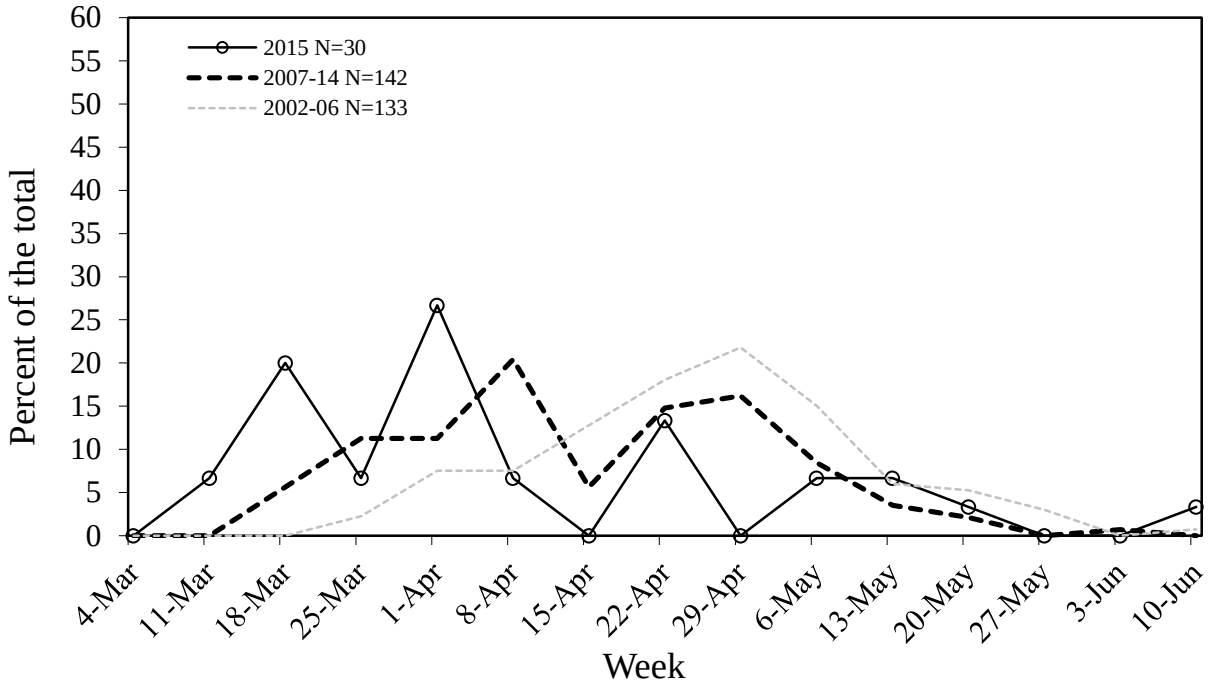

Figure 12. Summer steelhead arrival timing at the Grande Ronde adult collection facility in 2015 and for 2007-14 (rm 153.5) and mean arrival timing for 2002-06 (rm 163).

The first adult spring Chinook salmon was captured at UGRACF on 9 May 2015. A total of 980 (965 adult and 15 jack) spring Chinook salmon, were trapped from 9 May to 7 June (Table 10). The daily maximum water temperature rose above 20.0°C on 6 June prompting removal of the pickets from the trap on 7 June. This was the earliest removal since 2010 when the temperature related removal began. The total catch was made up of 200 adults and one jack of natural origin, 477 adults and 14 jacks from conventional broodstock, and 288 adults and no jacks from captive broodstock. A total of 786 adult (151 natural, 347 conventional, 288 captive) and seven conventional jack spring Chinook salmon were released above the weir to spawn naturally. Median arrival timing for natural and conventional adults was the week of 27 May and 3 June for the captive adults. This year arrival timing was about three weeks earlier than what was seen for 2010 to 2014 (Figure 13).

Table 10. Spring Chinook salmon trap capture, transport, and mortality data for the Grande Ronde River stock at the adult collection facility in 2015. Trapping began 2 March and ended 7 June.

Week	Trap capture[a]						Broodstock hauled				Trap Mort
	Nat.	(jack)	Capt.	(jack)	Conv.	(jack)	Nat.	(jack)	Conv.	(jack)	
6-May	0		0		0		0		0		
13-May	9		2		3		4		3		
20-May	44		59		47		23		46		
27-May	51		73		111		19		59		1
3-Jun	71	1	110		230	5	3	1	21	4	
10-Jun	25		44		86	9	0		0	3	
	200	1	288		477	14	49	1	129	7	1

[a] *Age 4 and 5 spring Chinook salmon(age 3 fish). Nat. = Naturally-produced, Capt. = Captive broodstock program, Conv. = Conventional broodstock program.*

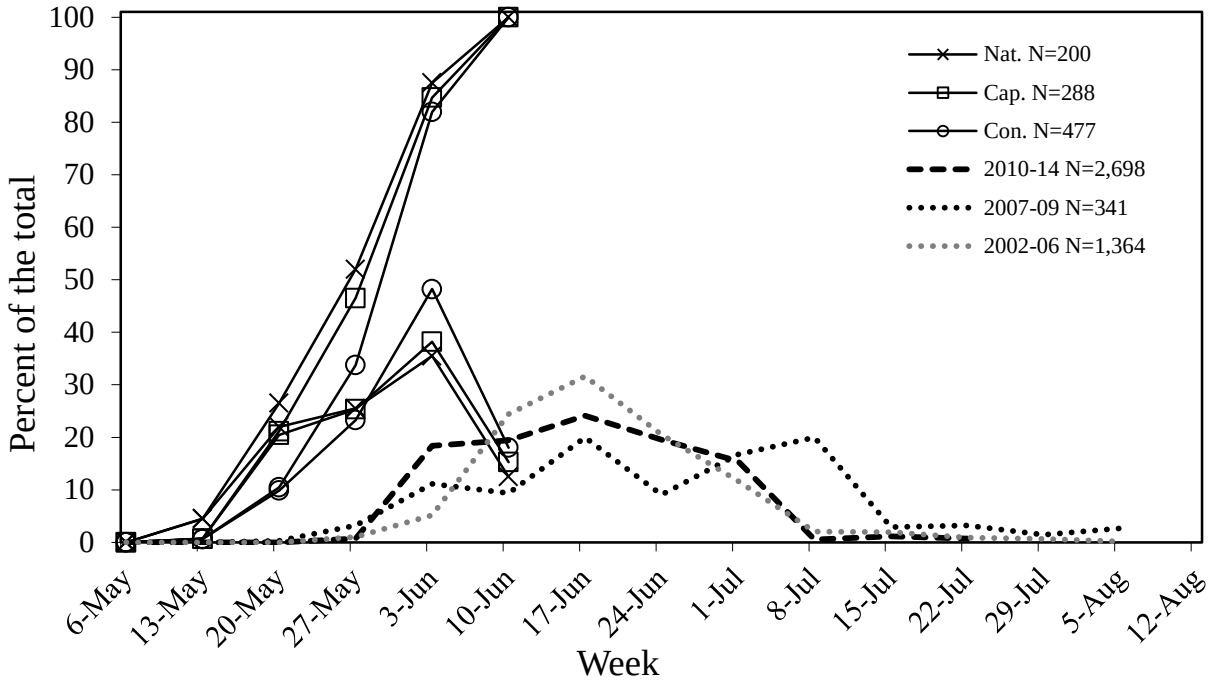

Figure 13. Arrival timing of age 4 and 5 spring Chinook salmon at the Upper Grande Ronde adult collection facility in 2015 and mean arrival timing for 2010 -14 (weir out early), 2007-09 (rm 153.5) and 2002-06 (rm 163).

The predicted adult spring Chinook salmon return to the upper Grande Ronde River for 2015 was 1,130 (390 natural + 740 hatchery). There is no sliding scale used for the upper Grande Ronde River. Up to 50% of the natural return and up to 100% of the conventional hatchery return can be collected for broodstock. Keeping in mind the fact that the weir was pulled from the river early due to high stream temperatures, the actual number of hatchery adults trapped was 764 (476 conventional, 288 captive) which was 103.2% of the predicted number. The number of natural adults trapped was 201 fish which was 51.5% of the predicted number. There were 245 males (44 natural, 201 hatchery) and seven hatchery jacks released above the weir (2.9% jacks). The goal of 10% jacks was not met due to the lack of jacks during the early part of the run while the weir was in operation.

The broodstock collection goal for 2015 was 170 adults and 8 jacks. The broodstock collected and transported from UGRACF consisted of both natural and conventional hatchery fish. Due to the high water temperatures observed and early removal of the weir, broodstock were only collected from 11 May to 5 June 2015. The collection of broodstock followed the contingency collection schedule and was adopted before trapping began due to the run being earlier in 2015 and the very low flows. A total of 49 adults and one jack of natural origin and 129 adults and seven jacks of conventional hatchery origin were transported to LGH for broodstock. The adult broodstock goal was exceeded by eight females in 2015. This was due to operator error. The natural adults collected for broodstock comprised 24.5% of the total adult natural return trapped while 16.9% of the adult hatchery fish trapped were collected for broodstock (27.0% of just the conventional return trapped). The portion of natural fish in the broodstock was 27.5%.

Gender classification of adults at spawning was compared to that at the weir to estimate the accuracy of sex determination. Accuracy at the weir was 96.0% (194/202). There were eight less

females in the broodstock than what was thought to be collected. This is the opposite of the usual misidentification where collected males turn into females. There was also one jack that was a female. In addition, there were 13 adult spring Chinook salmon with CWT but no-fin clip that returned to Lookingglass Hatchery that were retained for upper Grande Ronde broodstock. These fish were assumed to be from the upper Grande Ronde conventional program based on marking strategy.

Surveys conducted by ODFW resulted in 123 redds above the weir and none below the weir. Based on the number of redds below the weir there did not appear to be any weir effect. There were a total of 39 adult carcasses recovered above the weir. This was 5.0% of the total trapped and passed (786). Of the 39 carcasses recovered, 17 were punched fish resulting in a trap efficiency of 43.6%. The population estimate above the weir in 2015 was 1,803 adult fish (2015 Spawning Ground Survey Results, ODFW, unpublished).

The spring runoff occurred twice in 2015. The first peak was around the first of April, with flows dropping to a very low level after, and then peaking again towards the end of May (Figure 14). The flow also dropped dramatically after 10 June which was not that far off of the 5 year average only at a much lower level. There was never any sustained runoff in 2015 compared to the 5 year average. The earlier run timing observed this year may have been a direct result of the early peak in flow followed by a very low level until the end of May. The removal of the weir early does not allow for a true trap efficiency estimate because there is no way to distinguish between the fish that escaped past the weir due to holes or fish that passed the weir after it was removed.

Hourly water temperatures were taken at the UGRACF from 7 June to 15 July in 2015. Data from the logger was not recoverable before 7 June. River temperature was taken by hand from 1 May to 6 June at 0800 and 1700 hours each day. The water temperature from 1 May to 6 June ranged from 5.2^{o}C to 19.0^{o}C on 7 May and 6 June, respectively (Figure 15). The water temperature from 7 June to 15 July ranged from 10.8^{o}C to 29.1^{o}C on 14 June and 30 June, respectively. The hourly temperatures at the adult trap from 7 June to 15 July showed that the lowest water temperature usually occurred at 0600 and the highest water temperature usually occurred at 1500 hours (Figure 16). These peaks and troughs in the temperature profile were slightly different from what we have seen in the past (0800, 1700). This could be due to the fact that the hourly temperatures were taken later in the summer and did not include the spring temperatures. The time of day that the trap was checked and fish were handled was based on water temperature. We use daily maximum water temperature to estimate the removal date of the weir and adjust broodstock take accordingly. Average temperature was higher than the average of the previous five years.

Maintenance and repair activities conducted at the facility in 2015 consisted of installation, removal, and repair of the floating weir panels and trap, and gravel removal from under the weir panels and in front of the trapbox during the instream work window.

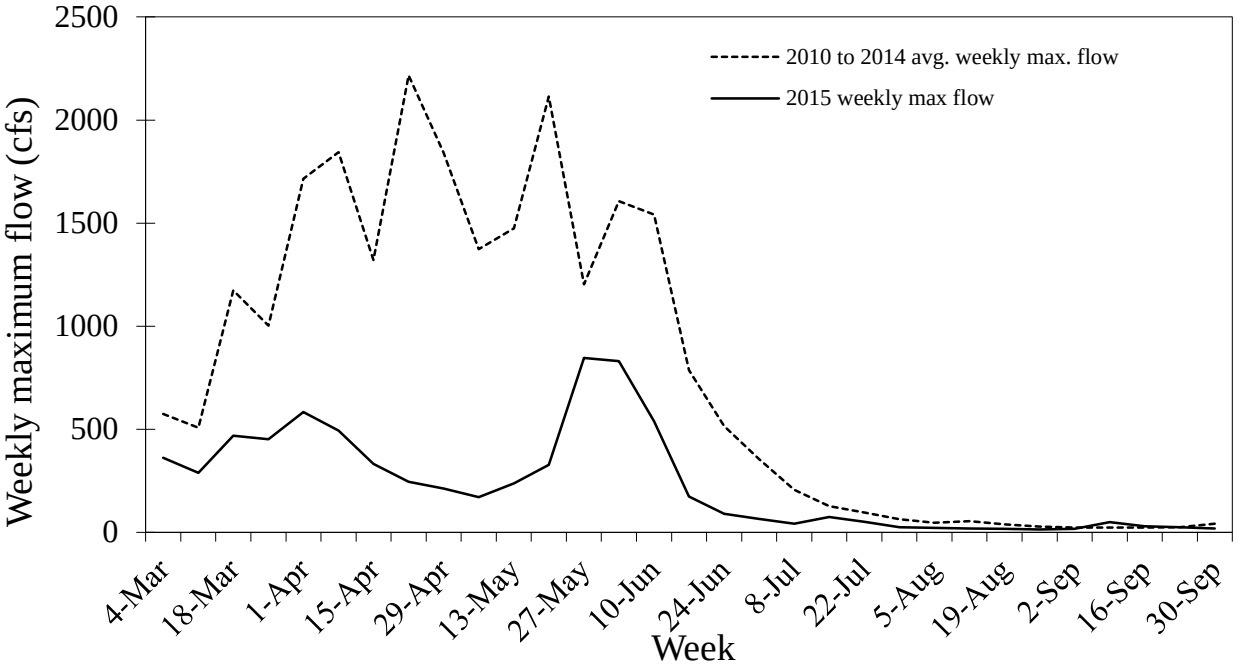

Figure 14. Weekly maximum flows (recorded daily) near the town of Perry, OR in 2015 (data from Oregon Water Resources Department (OWRD) website). Also shown is the mean weekly maximum flow for 2010 to 2014.

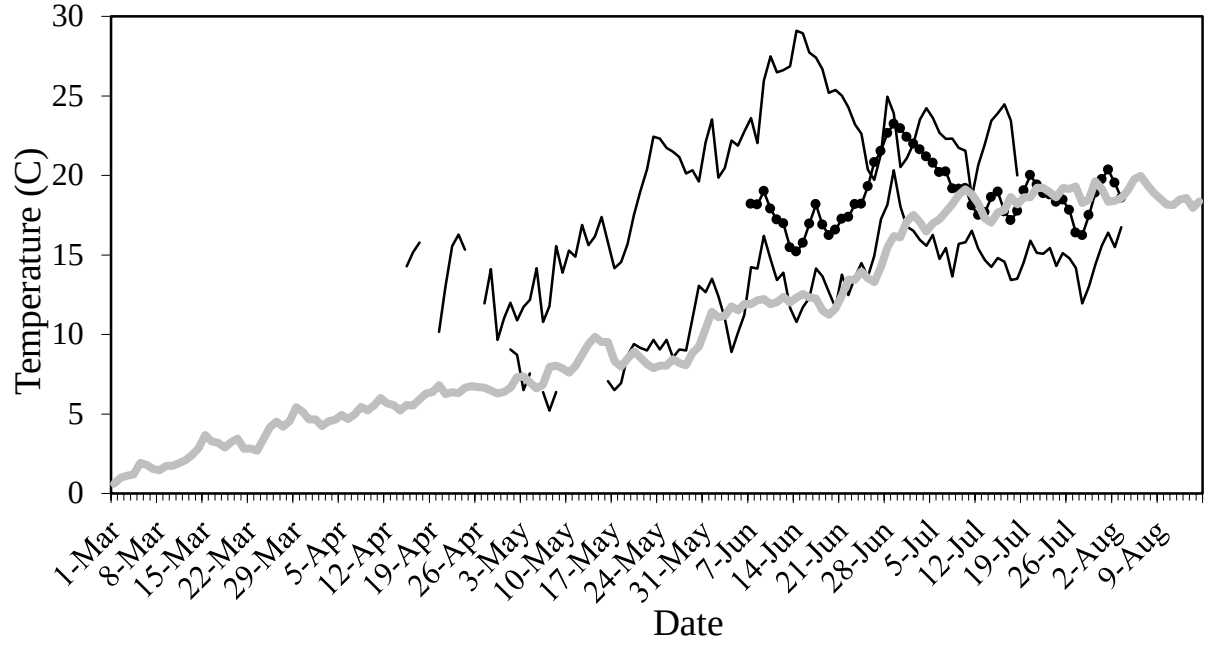

Figure 15. Daily maximum, minimum, and average water temperatures (recorded hourly) at the Upper Grande Ronde adult collection facility in 2015. Data from logger prior to 7 June was lost. Data points for 1 May to 6 June were taken by hand at 0800 and 1700 hours each day. The grey line is the average temperature from 2010-2014.

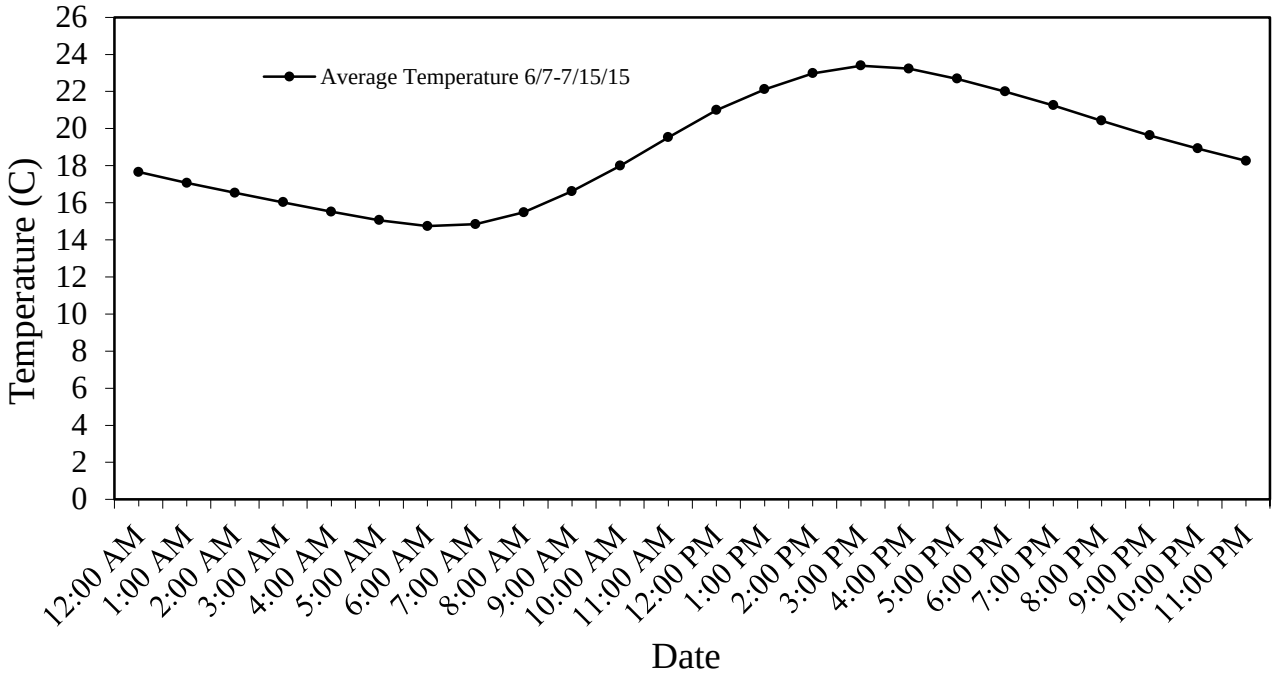

Figure 16. Average hourly water temperature at the Upper Grande Ronde adult collection facility in 2015.

Broodstock Activities

Lookingglass Hatchery

A total of 53 females, 59 males and four jacks were spawned from the Catherine Creek stock at LGH in 2015 (Tables 11-13). Eleven natural males were spawned twice. There were four pre-spawning mortalities (3 females, 1 male). Median spawning date at LGH occurred on 3 September (Appendix Table 21). In the past (2007 to 2011) we have seen the stock held in the indoor circular exhibit later median spawn dates than stocks held in the outdoor raceways. Beginning in 2012, a point was made to keep the sliding doors to the brood building open at all times and not use the overhead lights. This was done to increase natural lighting so as not to affect the natural photoperiod with artificial lighting. Since then we have seen a similar median spawn date between fish held in the indoor circular and fish held in the outdoor raceway (Appendix Table 25). All 53 females had BKD ELISA values of 0.094 OD units or less. The total number of green eggs collected was 233,109. The goal for the program is to supply 174,910 green eggs to make 150,000 smolts. There were a total of 54,456 green eggs from 12 females considered surplus. The number of viable eyed eggs that were outplanted to Indian Creek on 23 October 2015 was 34,050. The

eggs were released between river mile 5.50 and 5.75. The remainder of the surplus (12,075 eggs) will be outplanted as unfed fry in the same location in late February 2016. The number of eggs was exceeded due to low female pre-spawn mortality at the hatchery, our sex guess at the weir, and higher fecundity.

A total of 85 females, 90 males, and 6 jacks were spawned from the upper Grande Ronde stock in 2015 (Tables 14-16). There were five natural males spawned twice and one spawned 3 times. There were 18 pre-spawn mortalities (12 females, 5 males, and 1 jack). Median spawning date at LGH occurred on 28 August (Appendix Table 22). All 85 females had BKD ELISA values of 0.116 OD units or less. The total number of green eggs collected was 358,688. The goal for the program is to supply 281,690 green eggs to make 250,000 smolts. There were a total of 71,009 green eggs from 18 females considered surplus. The number of viable eyed eggs that were outplanted to Sheep Creek (Upper Grande Ronde River tributary) on 23 October 2015 was 34,936. The eggs were released between river mile 9.0 and 9.25. The remainder of the surplus (23,362) will be outplanted as unfed fry in Meadow Creek at river mile 2.77 in late February 2016. The number of eggs was exceeded due to over collection of females at the weir, Grande Ronde stock strays collected at LGH, our sex guess at the weir, and higher fecundity.

A total of 75 females, 77 males, and 6 jacks were spawned for the Lookingglass Creek program in 2015 (Tables 17-19). There was one hatchery male spawned twice. There were 22 pre-spawn mortalities (11 female, 9 male, 2 jack). Median spawning date occurred on 2 September (Appendix Table 23). One female had a BKD ELISA value of 1.167 OD units. All others (N=74) were 0.117 OD units or less. The eggs from this female were culled. The total number of green eggs collected was 262,782. The goal for the program is to supply 294,381 green eggs to make 250,000 smolts. The number of eggs fell short of the goal due to higher pre-spawn mortality, BKD, and lower fecundity.

In 2015, EN was used for the fourth year during the ripeness sorts. The EN system was not used on the Catherine Creek stock held in the circular tank due to logistical reasons. The mean egg viability in 2015 for stocks the EN was used on was 92%, while for Catherine Creek it was 89%.(Appendix Table 26). The mean egg viability from 2012 to 2015, the four years of the use of EN for Grande Ronde and Lookingglass Creek stocks, was 93% compared to 91% from 2008 to 2011. The egg viability for Catherine Creek stock (no EN) for 2012 to 2015 was 88% compared to 93% from 2008 to 2011.

Captive Broodstock

A total of two captive brood adults from the 2009 broodyear, 13 from the 2010 broodyear, and 146 from the 2011 broodyear were transported from BOH to LGH from on 3 June. This was the last of the mature adults from the program and it has now been discontinued. Because the estimated 2015 broodyear smolt production from the conventional broodstock was greater than 150,000 there was no need to spawn the captive adults. On 12 August 2015, 120 captive brood fish were transported from Lookingglass Hatchery for outplanting into Sheep Creek (rm 9.00 to 9.25), a tributary to the Upper Grande Ronde River. There were a total of 41 mortalities at LGH. During surveys on Sheep Creek in 2015 a total of one redd was observed and no carcasses were recovered (2015 Spawning Ground Survey Results, ODFW, unpublished).

Table 11. Spawning information from Catherine Creek spring Chinook salmon female broodstock at Lookingglass Hatchery in 2015

	Natural n=21					Hatchery n=35				
Date	Morts	Spawned	DPS	KPS	KNS	Morts	Spawned	DPS	KPS	KNS
Till 8/13	1					1				
13-Aug		1					1			
20-Aug		3					3			
27-Aug		4				1	5			
3-Sep		6					14			
10-Sep		6					10			
Totals	1	20	0	0	0	2	33	0	0	0

Table 12. Spawning information from Catherine Creek spring Chinook salmon male broodstock at Lookingglass Hatchery in 2015.

	Natural n=27					Hatchery n=23				
Date	Morts	Spawned[a]	DPS	KPS	KNS	Morts	Spawned[a]	DPS	KPS	KNS
Till 8/13						1				
13-Aug		1					1			
20-Aug		3					3			
27-Aug		2					5			
3-Sep		18					10		1	
10-Sep		14(11)	1	11			2		6	1
Totals	0	38	1	11	0	1	21	0	7	1

[a] *The number in parentheses indicates the number of recycled fish used in the total.*

Table 13. Spawning information from Catherine Creek spring Chinook salmon jack broodstock at Lookingglass Hatchery in 2015.

	Natural n=3					Hatchery n=1				
Date	Morts	Spawned	DPS	KPS	KNS	Morts	Spawned	DPS	KPS	KNS
Till 8/13										
13-Aug		0					0			
20-Aug		0					0			
27-Aug		2					0			
3-Sep		1					1			
10-Sep		0					0			
Totals	0	3	0	0	0	0	1	0	0	0

Table 14. Spawning information from Grande Ronde spring Chinook salmon female broodstock at Lookingglass Hatchery in 2015.

	Natural n=29					Hatchery n=68				
Date	Morts	Spawned	DPS	KPS	KNS	Morts	Spawned	DPS	KPS	KNS
Till 8/13	5					3				
13-Aug		0					0			
20-Aug	1	3				1	1			
27-Aug		7				1	28			
3-Sep		12				1	23			
10-Sep		0					10			
15-Sep		1					0			
Totals	6	23	0	0	0	6	62	0	0	0

Table 15. Spawning information from Grande Ronde spring Chinook salmon male broodstock at Lookingglass Hatchery in 2015.

	Natural n=17					Hatchery n=77				
Date	Morts	Spawned[a]	DPS	KPS	KNS	Morts	Spawned[a]	DPS	KPS	KNS
Till 8/13						2				
13-Aug		0					0			
20-Aug		1				1	4			
27-Aug	1	12					21			
3-Sep		6(4)					31		6	4
10-Sep		2(1)		4			11		3	1
15-Sep		1(1)	1	2		1	1			
Totals	1	22	1	6	0	4	68		9	5

[a] *The number in parentheses indicates the number of recycled fish used in the total.*

Table 16. Spawning information from Grande Ronde spring Chinook salmon jack broodstock at Lookingglass Hatchery in 2015.

	Natural n=1					Hatchery n=9				
Date	Morts	Spawned[a]	DPS	KPS	KNS	Morts	Spawned	DPS	KPS	KNS
Till 8/13						1				
13-Aug		0					0			
20-Aug		0					0			2
27-Aug		0					1			1
3-Sep		1					2			
10-Sep		0					2			
15-Sep		0					0			
Totals	0	1	0	0	0	1	5	0	0	3

Table 17. Spawning information from Lookingglass Creek spring Chinook salmon female broodstock at Lookingglass Hatchery in 2015.

	Natural n=29					Hatchery n=57				
Date	Morts	Spawned	DPS	KPS	KNS	Morts	Spawned	DPS	KPS	KNS
Till 8/19	1					7				
19-Aug		0					3			
26-Aug	1	4					11			
2-Sep		12				2	21			
9-Sep		11					13			
Totals	2	27	0	0	0	9	48	0	0	0

Table 18. Spawning information from Lookingglass Creek spring Chinook salmon male broodstock at Lookingglass Hatchery in 2015.

	Natural n=26					Hatchery n=62				
Date	Morts	Spawned[a]	DPS	KPS	KNS	Morts	Spawned[a]	DPS	KPS	KNS
Till 8/19	1					5				
19-Aug		2					1			
26-Aug	2	2					12			
2-Sep		5					26(1)			1
9-Sep		12		9	2	1	17	6	23	
Totals	3	21		9	2	6	56	6	23	1

[a] *The number in parentheses indicates the number of recycled fish used in the total.*

Table 19. Spawning information from Lookingglass Creek spring Chinook salmon jack broodstock at Lookingglass Hatchery in 2015.

	Natural n=1					Hatchery n=10				
Date	Morts	Spawned	DPS	KPS	KNS	Morts	Spawned	DPS	KPS	KNS
Till 8/19						2	0			
19-Aug		0					0			
26-Aug		1					0			
2-Sep		0					2			
9-Sep		0					3			3
Totals	0	1	0	0	0	2	5	0	0	3

LITERATURE CITED

GRSCHMP. 2002. Grande Ronde Spring Chinook Hatchery Management Plan. Co-manager signed agreement dealing with management of spring Chinook in the Grande Ronde Basin. Signed by CTUIR, NPT, LSRCP, and ODFW in 2002.

LSRCP AOP. 2015. Lower Snake River Compensation Plan Annual Operations Plan.

McLean, M. L., R. Seeger, and L. Hewitt. 2004. Grande Ronde Satellite Facility O&M Annual Report for 1 January-31 December 2004 to Bonneville Power Administration. BPA Project 9800703. CTUIR Project 410. Pendleton, Oregon.

McLean, M. L., R. Seeger, and L. Hewitt. 2005. Grande Ronde Satellite Facility O&M Annual Report for 1 January-31 December 2005 to Bonneville Power Administration. BPA Project 9800703. CTUIR Project 410. Pendleton, Oregon.

Monzyk, F. M., G. Vonderohe, T. L. Hoffnagle, R. W. Carmichael, D.L. Eddy and P.J. Keniry. 2006. Lower Snake River Compensation Plan: Oregon Spring Chinook Salmon Evaluation Studies. 1999 Annual Progress Report, Oregon Department of Fish and Wildlife, Salem.

Nehlsen, W., J. E. Williams, and J. A. Lichatowich. 1991. Pacific salmon at a crossroads: stocks at risk from California, Oregon, Idaho and Washington. Fisheries 16(2):4-20.

APPENDIX TABLES

Appendix Table 1. Sliding Scale Management Plan for the Catherine Creek and Upper Grande Ronde Spring Chinook Artificial Propagation Program.

Estimated total adult escapement to the Catherine Creek mouth (hatchery plus natural) [a]	Ratio of hatchery to natural adults at the mouth	Maximum % of natural adults to retain for broodstock	% of conventional hatchery adults to retain for broodstock [b]	% of adults released above the weir that can be of hatchery origin	Minimum % of broodstock of natural origin	% Strays allowed above the weir [c]
UGR	Any	Up to 50	Up to 100	Up to 100	[d]	≤5
CC						
<250	Any	40	40	[d]	[d]	≤5
251-500	Any	20	20	≤70	≥20	≤5
>500	Any	≤20	d	≤50	≥30	≤5

a Pre-season estimate of total escapement
b Conventional hatchery adults only, all captive brood adults released to spawn naturally or outplanted
c For hatchery adults originating from different gene conservation groups (Rapid River stock or strays from outside the Grande Ronde basin)
d Not decision factor at this level of escapement, percentage determined by other criteria
e Not to exceed 130,000 smolt production initially

Appendix Table 2. Group, number, size, raceways, mortality, feed fed, and numbers released from the Catherine Creek acclimation facility 2000 to 2015 release years.

Facility/ rel. yr	Group[a]	Number received	Size fish/lb.	Raceways used	Density lbs/ft^3	Total Mortality (%)	Feed fed	Number released
CC 00	Single cap	38,009	23.6	4	0.20	0.10	474	37,980
CC 01	Single cap	137,588	19.6	4	0.85	0.70	1,296	136,902
CC 02	Single cap	180,912	17.4	4	1.26	0.30	1,968	180,343
CC 03	Early cap	105,352	12.8	4	1.00	0.04	345	105,313
CC 03	Late con	24,404	12.6	2	0.47	0.05	73	24,392
CC 04	Early cap	92,475	23.1	4	0.49	0.07	179	92,413
CC 04	Late con	70,539	23.4	4	0.37	0.03	115	70,521
CC 05	Early con	61,743	23.6	2	0.63	0.03	100	61,717
CC 05	Early cap	69,005	24.4	2	0.70	0.23	109	68,827
CC 05	Late con	59,100	21.8	2	0.66	0.11	60	59,036
CC 06	Single con	23,227	33.7	1	0.33	0.05	65	23,216
CC 06	Single cap	45,667	26.1	2	0.42	0.14	132	45,604
CC 07	Single con	49,709	27.4	3	0.29	0.03	202	49,696
CC 07	Single cap	21,584	24.9	1	0.42	0.06	86	21,572
CC 08	Single con	116,967	19.9	4	0.71	0.07	549	116,882
CC 09	Single con	93,240	27.4	3	0.58	0.07	229	93,176
CC 09	Early con	25,436	22.7	1	0.48	0.06	18	25,422
CC 09	Late con	20,254	20.6	1	0.44	0.04	35	20,245
CC 10	Single con	110,445	20.8	3	0.79	0.18	248	110,242
CC 10	Single cap	34,215	21.0	1	0.73	0.32	83	34,111
CC 11	Single con	58,887	26.6	2	0.54	0.25	300	58,737
CC 11	Single cap	50,194	25.6	2	0.41	0.02	126	48,343
CC 11	Single cap	50,246	24.9	2	0.50	0.02	173	48,395
CC 12	Single con	106,939	21.8	4	0.55	0.05	278	106,882
CC 13	Single con	134,591	22.0	4	0.69	0.05	491.5	134,519
CC 14	Single con	138,526	22.3	4	0.70	0.11	474.5	138,369
CC 15	Single con	146,394	20.8	4	0.71	0.06	619.5	146,310

[a] *Single= one acclimation period. Early=1st of 2 groups. Late= 2nd of 2 groups.*

Appendix Table 3. Group, number, size, raceways, mortality, feed fed, and numbers released from the Upper Grande Ronde acclimation facility 2000 to 2015 release years.

Facility/ rel. yr	Groupa	Number received	Size fish/lb.	Raceways used	Density lbs/ft3	Total Mortality (%)	Feed fed	Number released
GR 00	Single cap	1,512	19.4	1	0.04	0.30	1	1,508
GR 01	Single cap	2,570	13.9	1	0.09	1.01	8	2,544
GR 02	Single cap	201,958	18.4	4	1.33	25.01	568	151,444
GR 03	Early cap	110,169	14.2	4	1.14	0.05	24	110,114
GR 03	Late con	26,946	13.7	1	0.90	0.09	50	26,923
GR 03	Late cap	100,685	13.6	3	1.10	0.16	150	100,523
GR 04	Early cap	77,418	20.3	4	0.48	0.27	58	77,204
GR 04	Late con	70,098	22.4	3	0.50	0.01	79	70,088
GR 05	Single con	105,418	21.0	4	0.61	0.05	10	105,369
GR 06	Single con	18,986	29.3	2	0.16	0.05	3	18,977
GR 07	Early cap	20,620	23.2	2	0.22	0.00	9	20,620
GR 07	Late con	118,840	21.7	4	0.67	0.03	120	118,803
GR 08	Early con	127,552	21.8	4	0.71	0.05	0	127,491
GR 08	Late con	132,501	20.9	4	0.77	0.05	38	132,441
GR 09	Single con	94,203	22.7	3	0.72	0.06	28.2	94,148
GR 09	Early cap	28,080	22.0	1	0.63	0.04	0	28,068
GR 09	Late cap	24,340	20.2	1	0.66	0.03	7.5	24,332
GR 10	Early cap	125,951	28.3	4	0.50	0.07	0	125,868
GR 10	Late con	41,873	23.0	2	0.41	0.13	63	41,819
GR 10	Late cap	64,721	21.4	2	0.68	0.09	63	64,663
GR 11	Early cap	53,166	24.0	2	0.54	0.10	23	53,114
GR 11	Early con	55,160	27.7	2	0.49	0.51	23	54,880
GR 11	Late con	134,882	17.7	4	0.81	0.37	242	134,388
GR 12	Early con	73,402	23.0	2	0.72	0.16	86	73,286
GR 12	Single con	73,402	23.0	2	0.72	0.13	38	73,303
GR 12	Late con	72,211	20.5	2	0.79	0.03	47	72,192
GR 13	Early cap	155,321	24.0	4	0.72	0.04	131.0	155,264
GR 13	Late con	135,370	21.5	4	0.70	0.05	161.5	135,308
GR 14	Early con	121,633	22.8	4	0.60	0.02	67.8	121,612
GR 14	Late con	119,582	21.5	4	0.62	0.02	168.5	119,557
GR 15	Early con	118,445	22.0	4	0.60	0.02	270.7	118,357
GR 15	Late con	106,100	20.8	4	0.60	0.02	234.1	106,086

[a] *Single= one acclimation period. Early=1st of 2 groups. Late= 2nd of 2 groups.*

Appendix Table 4. Group, acclimation dates, temperature, dissolved oxygen, and estimated volitional migration of fish acclimated at the Catherine Creek facility 2000 to 2015 release years.

Facility/ rel. yr	Group[a]	Acclimation period	Volitional began	Temp.°C		DO mg/l		Volitional	
				Min.	Max.	Min.	Max.	migration	%
CC 00	Single cap	2/28-4/18	4/2	0.2	9.3	8.2	14.4	6,842	18.0
CC 01	Single cap	3/8-4/16	4/2	0.5	9.6	8.9	13.9	[b]	
CC 02	Single cap	2/26-4/15	4/2	0.0	10.5	7.0	13.3	68,948	38.1
CC 03	Early cap	3/7-3/23	3/13	1.1	6.2	10.3	12.2	25,092	23.8
CC 03	Late con	3/24-4/14	3/31	0.7	8.2	9.7	12.6	16,218	66.4
CC 04	Early cap	3/8-3/22	3/15	1.8	7.9	10.5	11.7	8,785	9.5
CC 04	Late con	3/24-4/12	3/30	2.1	8.2	10.5	12.4	49,147	69.2
CC 05	Early mix	3/7-3/27	3/14	0.1	5.8	9.6	15.4	29,402	22.5
CC 05	Late con	3/28-4/7	4/4	0.6	8.7	8.9	12.7	None	
CC 06	Single mix	3/13-4/12	3/27	0.2	7.6	9.0	11.4	28,311	41.1
CC 07	Single mix	3/12-4/11	3/26	0.3	8.8	9.6	12.3	23,761	33.3
CC 08	Single con	3/10-4/14	3/24	0.0	9.1	9.0	12.4	43,128	35.2
CC 09	Single con	3/9 – 4/13	3/23	0.0	7.5	8.9	11.8	48,442	52.0
CC 09	Early con	3/9 – 3/23	3/16	0.0	6.7	10.0	11.8	18,059	71.0
CC 09	Late con	3/24 – 4/13	4/1	0.6	7.5	9.9	11.3	8,613	42.5
CC 10	Single mix	3/15 – 4/12	3/29	0.2	7.6	8.5	12.6	21,357	14.8
CC 11	Single con	3/14 – 4/14	3/30	1.2	6.9	9.7	11.5	22,027	37.4
CC 11	Early cap	3/14 – 3/29	3/21	1.2	5.9	9.8	11.5	3,383	7.0
CC 11	Late cap	3/30 – 4/14	4/5	1.5	6.9	10.0	10.9	12,767	26.4
CC 12	Single con	3/20 – 4/14	3/22	0.5	8.1	11.0	13.6	53,377	49.9
CC 13	Single con	3/19 – 4/15	3/21	NA	NA	10.6	12.3	63,500	47.2
CC 14	Single con	3/19 – 4/15	3/21	0.1	7.8	10.4	15.0	72,967	52.7
CC 15	Single con	3/17 – 4/15	3/19	1.2	8.0	8.4	13.4	NA	

[a] *Single= one acclimation period. Early=1st of 2 groups. Late= 2nd of 2 groups.*

[b] *Problems with PIT tag readers made it impossible to estimate accurately the number of PIT tagged fish leaving volitionally or during force out from the Catherine Creek facility. Actual PIT tags detected during the volitional release period were 290; tags detected during the force out were 6,862.*

Appendix Table 5. Group, acclimation dates, temperature, dissolved oxygen, and estimated volitional migration of fish acclimated at the Upper Grande Ronde facility 2000 to 2015 release years.

Facility/ rel. yr	Group[a]	Acclimation period	Volitional began	Temp.°C		DO mg/l		Volitional	
				Min.	Max.	Min.	Max.	migration	%
GR 00	Single cap	2/28-3/14	None	-0.5	2.7	-	-	None	
GR 01	Single cap	2/27-3/27	None	-0.7	3.8	8.7	12.1	None	
GR 02	Single cap	2/27-4/15	4/2	0.0	3.5	9.2	12.7	68,200	44.9
GR 03	Early cap	3/10-3/23	3/17	0.0	4.4	10.0	11.9	31,900	30.0
GR 03	Late mix	3/24-4/14	3/30	0.0	6.6	9.0	11.9	37,900	29.7
GR 04	Early cap	3/9-3/22	3/15	-0.1	5.9	11.3	14.7	12,889	16.3
GR 04	Late con	3/25-4/12	3/31	-0.1	7.1	10.6	12.3	34,085	48.6
GR 05	Single con	3/8-3/14	None	-0.1	3.4	10.3	11.9	None	
GR 06	Single con	3/13-4/12	3/27	-0.7	4.5	10.3	12.3	10,461	55.1
GR 07	Early cap	3/12-3/25	3/19	-0.1	5.4	8.7	12.7	2,932	11.6
GR 07	Late con	3/26-4/11	4/2	-0.1	6.9	8.5	11.9	28,718	24.2
GR 08	Early con	3/11-3/24	3/17	-5.8	2.6	na	na	29,065	22.8
GR 08	Late con	3/25-4/14	4/7	-5.9	4.3	na	na	10,880	8.2
GR 09	Single con	3/16 – 4/13	3/23	-0.1	4.0	11.3	13.5	54,859	58.3
GR 09	Early cap	3/16 – 3/23	3/18	-0.1	1.8	11.3	13.5	3,013	10.7
GR 09	Late cap	3/24 – 4/13	4/1	-0.1	4.0	11.7	13.5	10,264	42.2
GR 10	Early cap	3/8 – 3/22	3/15	-5.5	3.5	9.4	14.7	20,000	15.9
GR 10	Late mix	3/23 – 4/13	3/30	-3.6	5.6	10.0	12.5	16,000	15.0
GR 11	Early cap	3/15 – 3/30	3/22	-0.1	3.2	10.8	13.3	2,069	3.8
GR 11	Early con	3/15 – 3/30	3/22	-0.1	3.2	10.8	13.3	4,048	7.6
GR 11	Late con	3/31 – 4/14	4/5	-0.1	4.0	10.0	12.0	15,413	11.4
GR 12	Early con	3/19 – 4/2	3/21	0.0	5.0	7.9	9.2	17,100	23.3
GR 12	Single con	3/19 – 4/14	3/22	0.0	6.2	7.9	9.3	5,800	7.9
GR 12	Late con	4/4 – 4/14	4/9	-0.1	6.2	8.1	9.3	9,545	13.2
GR 13	Early cap	3/18 – 4/1	3/20	-5.5	0.3	10.6	12.9	41,719	26.9
GR 13	Late con	4/4 – 4/14	4/6	-0.1	5.5	10.4	12.7	41,857	30.9
GR 14	Early con	3/20 – 4/3	3/22	-0.1	4.5	11.1	13.6	NA	
GR 14	Late con	4/4 – 4/15	4/6	0.2	6.7	10.6	12.5	NA	
GR 15	Early con	3/16 – 3/30	3/18	0.2	7.0	9.7	11.8	NA	
GR 15	Late con	3/31 – 4/15	4/1	-0.1	6.8	9.7	12.2	NA	

[a] *Single= one acclimation period. Early=1st of 2 groups. Late= 2nd of 2 groups.*

[b] *Problems with PIT tag readers made it impossible to estimate accurately the number of PIT tagged fish leaving volitionally or during force out from the Catherine Creek facility. Actual PIT tags detected during the volitional release period were 290; tags detected during the force out were 6,862.*

Appendix Table 6. Release and return summary for spring Chinook salmon from Catherine Creek 1998 to 2013 broodyears. Numbers updated from previous years reports.

Brood year	Release location	Life stage	Rearing Type	Number released	Returns trapped[a]			Min. SAR
					3	4	5	
1998	Acc.	Smolt	Captive ad	37,980	29	132	54	0.57
1999	Acc.	Smolt	Captive ad	136,902	10	181	19	0.15
2000	Acc.	Smolt	Captive ad	180,343	70	564	24	0.36
2001	Acc.	Smolt	Captive ad	105,313	30	84	2	0.11
2001	Acc.	Smolt	Conventional ad vie	24,392	22	28	3	0.22
2002	Acc.	Smolt	Captive ad	92,413	18	118	15	0.16
2002	Acc.	Smolt	Conventional ad vie	70,521	12	59	4	0.11
2003	Acc.	Smolt	Captive ad	68,827	0	61	7	0.10
2003	Acc.	Smolt	Conventional ad vie	120,753	7	57	2	0.05
2004	Acc.	Smolt	Captive ad	45,604	23	90	5	0.26
2004	Acc.	Smolt	Conventional ad vie	23,216	5	48	1	0.23
2005	Acc.	Smolt	Captive ad vie Blue	21,572	6	22	0	0.13
2005	Acc.	Smolt	Conventional ad	49,696	97	116	74	0.58
2006	Acc.	Smolt	Conventional ad	116,882	386	779	22	1.02
2007	IndianCr	Egg	Captive	46,727	Unk	Unk	Unk	--
2007	Acc.	Smolt	Conventional ad	138,843	90	115	28	0.17
2008	Acc.	Smolt	Captive ad	34,111	57	185	3	0.72
2008	Acc.	Smolt	Conventional ad vie	110,242	77	353	11	0.40
2009	Acc.	Smolt	Captive ad	96,738	23	201	35	0.27
2009	Acc.	Smolt	Conventional ad vie	58,737	14	45	5	0.11
2010	Acc.	Smolt	Conventional ad	106,882	130	291	14	0.41
2010[b]	Dir.stream	Smolt	Conventional ad	54,492	69	134	0	0.37
2011	Acc.	Smolt	Conventional ad	134,519	88	379		
2012	Acc.	Smolt	Conventional ad	138,369	48			
2013	Acc.	Smolt	Conventional ad	146,310				

a *Age structure calculated using length data. Adult returns are actual numbers trapped at the weir.*

b *Number of fish returning was estimated using PIT tag recoveries from this group.*

Appendix Table 7. Release and return summary for spring Chinook salmon from the upper Grande Ronde River 1998 to 2013 broodyears. Numbers updated from previous years reports.

Brood year	Release location	Life stage	Rearing Type	Number released	Returns trapped[a]			Min. SAR
					3	4	5	
1998	Acc.	Smolt	Captive	1,508	0	3	0	0.20
1999	Acc.	Smolt	Captive	2,544	0	6	4	0.39
2000	Acc.	Smolt	Captive	151,444	35	321	15	0.24
2000	Dir. stream	Parr	Captive	76,941	2	51	2	0.07
2001	Acc.	Smolt	Captive	210,637	48	180	7	0.11
2001	Acc.	Smolt	Conventional vie or	26,923	9	60	0	0.26
2001	Dir. stream	Parr	Captive ad	32,800	0	0	0	0.00
2002	Acc.	Smolt	Captive ad	77,204	0	1	0	0.00
2002	Acc.	Smolt	Conventional cwt	70,088	6	140	8	0.22
2003	Acc.	Smolt	Captive ad	1,022	0	0	0	0.00
2003	Acc.	Smolt	Conventional cwt	104,347	2	27	1	0.03
2004	Acc.	Smolt	Captive ad	76	0	0	1	1.32
2004	Acc.	Smolt	Conventional cwt	18,901	5	8	20	0.17
2005	Acc.	Smolt	Captive ad	20,620	5	40	16	0.30
2005	Acc.	Smolt	Conventional cwt	118,803	98	258	29	0.32
2006	Acc.	Smolt	Conventional	259,932	301	1,114	13	0.55
2006	MeadowCr	Egg	Captive	1,263	Unk	Unk	Unk	--
2007	Acc.	Smolt	Captive ad	52,404	12	47	7	0.13
2007	Acc.	Smolt	Conventional cwt	94,148	15	61	12	0.09
2008	Acc.	Smolt	Captive ad	190,531	45	355	8	0.21
2008	Acc.	Smolt	Conventional cwt	41,819	43	113	5	0.38
2009	MeadowCr	Egg	Captive	143,349	Unk	Unk	Unk	
2009	Acc.	Smolt	Captive ad	53,114	3	10	7	0.04
2009	Acc.	Smolt	Conventional cwt	189,268	17	57	5	0.04
2010	MeadowCr	Egg	Captive	251,107	Unk	Unk	Unk	
2010	Acc.	Smolt	Conventional	218,781	34	259	25	0.15
2010	Dir.stream	Smolt	Conventional	66,956	8	86	4	0.15
2011	MeadowCr	Egg	Captive	96,885	Unk	Unk		
2011	SheepCr	Egg	Captive	103,365	Unk	Unk		
2011	Acc.	Smolt	Captive	155,264	10	288		
2011	Acc.	Smolt	Conventional	135,308	11	447		
2012	Acc.	Smolt	Conventional	241,169	14			
2013	Acc.	Smolt	Conventional	224,443				

a *Age structure calculated using length data. Adult returns are actual numbers trapped at the weir. When life stage release from the same broodyear could not be determined at the trap (similar marks), CWT or PIT tag data was used to divide the returns by group. The weir was pulled from the stream early beginning in 2010 due to high stream temperature . A portion of the later returning fish is unknown.*

Appendix Table 8. Release and return summary for spring Chinook salmon from Lookingglass Creek 2000 to 2013 broodyears. Numbers updated from previous years reports.

Brood year	Release location	Life stage	Rearing type	Number released	Returns trapped[a]			Min. SAR
					3	4	5	
2000	LGC	Parr	Captive	51,864	13	39	2	0.10
2001	LGC	Parr	Captive	17,880	11	24	1	0.20
2002	Hat.	Smolt	Captive	53,333	12	41	9	0.12
2003	Hat.	Smolt	Captive	98,023	22	98	15	0.14
2004	Hat.	Smolt	Cap/Conv	149,857	57	259	16	0.22
2005	Hat.	Smolt	Cap/Conv	0	0	0	0	--
2006	Hat.	Smolt	Captive	43,218	185	362	24	1.32
2007	Hat.	Smolt	Cap/Conv	150,477	120	467	30	0.41
2008	Hat.	Smolt	Conv.	262,911	680	915	32	0.62
2009	Hat.	Smolt	Conv.	102,828	56	192	57	0.30
2010	Hat.	Smolt	Conv.	228,565	484	522	20	0.45
2011	Hat.	Smolt	Conv.	273,097	215	652		
2012	Hat.	Smolt	Conv.	251,780	96			
2013	Hat.	Smolt	Conv.	176,440				

a *Age structure calculated using length data. Adult returns are actual numbers trapped at the weir. Trap operated by ODFW Lookingglass Hatchery.*

Appendix Table 9. Adult trapping, broodstock and redd counts for spring Chinook salmon from Catherine Creek 1997 to 2015 (does not include jack salmon).

Year	Adults captured			Mort		Passed above	Est. above	Trap eff	Redds		Adult broodstock		
	Nat	Cap	Con	N	H				Above	Below	Nat	Cap	Con
1997	2	--	--	0		2	--	--	40	6	0	0	0
1998	28	--	--	0		28	105	26.7	34	0	0	0	0
1999	16	--	--	0		16	87	18.4	38	2	0	0	0
2000	22	--	--	1		21	40	52.5	26	8	0	0	0
2001	80	1	--	0		57	352	16.2	131	2	22	0	0
2002	161	132	--	0	1	257	427	60.2	156	2	34	0	0
2003	250	235	--	2	0	432	449	96.2	165	2	50	0	0
2004	84	584	--	2	3	192	203	94.6	94	2	17	0	0
2005	56	110	28	0	2	139	145	95.9	72	2	10	0	20
2006	103	121	62	0	1	221	263	84.0	115	2	20	0	43
2007	72	81	61	0	0	142	181	78.5	57	2	28	0	37
2008	90	97	50	0	0	186	197	94.4	100	1	18	0	33
2009	116	27	118	0	0	175	195	89.7	87	2	31	0	52
2010	438	0	855	1	1	813	904	89.9	373	11	30	0	42
2011	89	0	137	0	0	103	1,238	8.3	444	0	37	0	45
2012	362	185	381	0	3	630	688	91.6	238	1	48	0	38
2013	245	204	56	1	1	409	418	97.8	110	0	54	0	41
2014	546	41	424	0	0	909	986	91.4	363	18	57	5	40
2015	288	--	392	3	4	465	471	98.8	215	7	51	0	55

Appendix Table 10. Adult trapping, broodstock and redd counts for spring Chinook salmon from the upper Grande Ronde River 1997 to 2015 (does not include jack salmon).

	Adults captured			Mort		Passed	Est.	Trap	Redds		Adult broodstock		
Year	Nat	Cap	Con	N	H	above	above	eff	Above	Below	Nat	Cap	Con
1997	9	--	--	0	0	9	--	--	19	6	0	0	0
1998	33	--	--	0	0	29	102	28.4	31	2	4	0	0
1999	1	--	--	0	0	1	--	--	0	0	0	0	0
2000	17	--	--	2	0	15	23	65.2	8	12	0	0	0
2001	50	--	--	0	0	29	29	100.0	7	8	21	0	0
2002	101	3	--	2	0	54	54	100.0	16	2	48	0	0
2003	145	6	--	1	0	78	92	84.8	19	19	72	0	0
2004	30	376	--	0	4	387	425	91.1	134	51	15	0	0
2005	14	197	60	0	1	204	204	100.0	52	38	7	0	59
2006	49	8	140	0	0	48	48	100.0	18	4	26	0	123
2007	33	0	35	0	1	16	16	100.0	1	0	17	0	34
2008	17	0	9	0	0	8	184	4.3	37	5	9	0	9
2009	58	41	278	0	0	214	321	66.7	50	2	17	0	146
2010	63	16	1,143	0	4	1,048	2,273	46.1	316	16	29	0	141
2011	16	47	75	0	4	51	966	5.3	221	4	9	0	73
2012	168	362	125	0	1	494	707	69.9	95	2	79	0	81
2013	47	18	62	0	0	44	845	5.2	41	0	24	0	59
2014	242	8	349	1	2	460	1,648	26.9	255	6	55	0	81
2015	201	288	476	0	1	786	1,803	43.6	123	0	49	0	129

Appendix Table 11. Adult trapping, broodstock and redd counts for spring Chinook salmon from Lookingglass Creek 2004 to 2015 (does not include jack salmon)(Trap operated by ODFW Lookingglass Hatchery).

	Adults captured			Mort		Passed	Est.	Trap	Redds		Adult broodstock	
Year	Nat	Hat	Stray	N	H	above	above	eff	Nat	Cap	Nat	Hat
2004	71	43	0	1	1	100	103	97.1	49	49	0	136
2005	24	26	4	0	0	41	43	95.3	29	10	0	0
2006	10	42	16	0	0	41	55	74.5	28	28	0	0
2007	13	107	18	0	0	66	66	100.0	32	22	0	41
2008	49	276	9	0	0	179	179	100.0	104	39	11	135
2009	78	38	17	0	0	83	83	100.0	67	30	27	14
2010	126	389	46	0	0	348	348	100.0	170	89	58	108
2011	131	492	24	0	0	440	444	99.1	212	129	58	123
2012	142	945	24	0	0	926	970	95.5	314	133	47	112
2013	59	225	31	0	0	160	160	100.0	60	47	28	97
2014	183	580	20	0	0	599	642	93.3	205	105	56	107
2015	238	670	13	0	1	735	744	98.8	185	91	54	118

Appendix Table 12. Daily summer steelhead trapping data from the Catherine Creek adult collection facility in 2015.

		Trapped		Sacrificed/mortality		Recaptures at trap	
DATE	TOTAL	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.
13-Mar	2	0	2	0	0	0	0
16-Mar	36	0	36	0	0	0	0
18-Mar	31	0	31	0	0	0	1
20-Mar	17	0	17	0	0	0	0
23-Mar	10	0	10	0	0	0	1
25-Mar	2	0	2	0	0	0	0
27-Mar	10	0	10	0	0	0	0
30-Mar	30	0	30	0	0	0	2
MAR	138	0	138	0	0	0	4
1-Apr	10	0	10	0	0	0	0
3-Apr	1	0	1	0	0	0	0
6-Apr	4	0	4	0	0	0	0
8-Apr	3	0	3	0	0	0	0
10-Apr	3	0	3	0	0	0	1
13-Apr	14	0	14	0	0	0	1
14-Apr	8	0	8	0	0	0	0
17-Apr	2	0	2	0	0	0	0
20-Apr	20	0	20	0	0	0	0
21-Apr	8	0	8	0	0	0	1
22-Apr	11	0	11	0	0	0	0
23-Apr	9	0	9	0	0	0	1
24-Apr	12	0	12	0	0	0	0
27-Apr	7	0	7	0	0	0	0
28-Apr	4	0	4	0	0	0	0
29-Apr	5	0	5	0	0	0	1
30-Apr	6	0	6	0	0	0	0
APR	127	0	127	0	0	0	5
1-May	4	0	4	0	0	0	0
4-May	7	0	7	0	0	0	1
5-May	2	0	2	0	0	0	0
6-May	5	0	5	0	0	0	0
8-May	4	0	4	0	0	0	0
12-May	2	0	2	0	0	0	0
13-May	1	0	1	0	0	0	0
15-May	2	0	2	0	0	0	0
16-May	0	0	0	0	0	0	0
22-May	1	0	1	0	0	0	0
23-May	0	0	0	0	0	0	0
MAY	28	0	28	0	0	0	1
Total	293	0	293	0	0	0	10

Appendix Table 13. Daily spring Chinook salmon trapping data from the Catherine Creek adult collection facility in 2015.

		Trapped				Sacrificed/mortality				Brood collected			
		Adults		Jacks		Adults		Jacks		Adults		Jacks	
Date	Total	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.
11-May	2	1	1	0	0	0	0	0	0	0	0	0	0
15-May	4	1	3	0	0	0	0	0	0	0	2	0	0
18-May	4	0	4	0	0	0	0	0	0	0	2	0	0
20-May	58	25	33	0	0	0	0	0	0	4	2	0	0
21-May	11	7	4	0	0	0	0	0	0	0	0	0	0
22-May	23	9	14	0	0	0	0	0	0	0	0	0	0
23-May	42	24	18	0	0	0	0	0	0	0	0	0	0
24-May	41	25	16	0	0	0	0	0	0	0	0	0	0
25-May	35	16	19	0	0	0	0	0	0	0	0	0	0
26-May	25	18	7	0	0	0	0	0	0	3	6	0	0
27-May	24	17	6	1	0	0	0	0	0	1	5	0	0
28-May	38	26	12	0	0	0	0	0	0	4	5	0	0
29-May	46	27	18	0	1	0	0	0	0	0	0	0	0
30-May	9	6	2	0	1	0	0	0	0	5	1	0	1
31-May	53	37	14	1	1	0	0	0	0	3	11	1	1
MAY	415	239	171	2	3	0	0	0	0	20	34	1	2
1-Jun	30	17	11	1	1	0	0	0	0	0	7	0	0
2-Jun	19	16	3	0	0	0	0	0	0	0	0	0	0
3-Jun	21	9	11	0	1	0	0	0	0	3	0	0	1
4-Jun	10	6	3	1	0	0	0	1	0	2	0	0	0
5-Jun	10	4	4	1	1	0	0	0	0	0	0	0	0
7-Jun	73	33	28	8	4	0	0	0	0	14	5	0	0
8-Jun	25	12	8	4	1	0	0	0	0	0	0	0	0
9-Jun	34	10	12	9	3	0	0	7	0	0	0	0	0
10-Jun	18	7	6	5	0	0	0	5	0	6	4	0	0
11-Jun	12	9	2	1	0	0	0	1	0	7	1	0	0
12-Jun	25	10	7	8	0	0	0	6	0	3	0	0	0
15-Jun	18	7	5	5	1	0	0	5	0	0	0	0	0
16-Jun	3	1	1	1	0	0	0	1	0	0	0	0	0
17-Jun	9	4	4	0	1	0	0	0	0	0	0	0	0
19-Jun	11	3	7	1	0	0	0	1	0	0	0	0	0
22-Jun	8	4	3	0	1	0	0	0	0	0	0	0	0
29-Jun	2	1	0	1	0	0	0	1	0	0	0	0	0
30-Jun	2	0	2	0	0	0	0	0	0	0	0	0	0
JUN	330	153	117	46	14	0	0	28	0	35	17	0	1
Total	745	392	288	48	17	0	0	28	0	55	51	1	3

Appendix Table 14. Daily summer steelhead trapping data from the Upper Grande Ronde adult collection facility in 2015.

		Trapped		Sacrificed/mortality		Recaptures at trap	
DATE	TOTAL	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.
9-Mar	2	0	2	0	0	0	0
13-Mar	2	0	2	0	0	0	0
16-Mar	4	0	4	0	0	0	0
23-Mar	2	0	2	0	0	0	0
27-Mar	1	0	1	0	0	0	0
30-Mar	4	0	4	0	0	0	0
MAR	15	0	15	0	0	0	0
1-Apr	3	0	3	0	0	0	0
3-Apr	1	0	1	0	0	0	0
6-Apr	1	0	1	0	0	0	0
17-Apr	1	0	1	0	0	0	0
20-Apr	2	0	2	0	0	0	0
22-Apr	1	0	1	0	0	0	0
29-Apr	0	0	0	0	0	0	0
APR	9	0	9	0	0	0	0
1-May	1	0	1	0	0	0	0
4-May	0	0	0	0	0	0	0
6-May	1	0	1	0	0	0	0
7-May	0	0	0	0	0	0	0
8-May	0	0	0	0	0	0	0
9-May	0	0	0	0	0	0	0
11-May	2	0	2	0	0	0	0
12-May	0	0	0	0	0	0	0
13-May	0	0	0	0	0	0	0
14-May	0	0	0	0	0	0	0
17-May	0	0	0	0	0	0	0
18-May	1	0	1	0	0	0	0
19-May	0	0	0	0	0	0	0
20-May	0	0	0	0	0	0	0
21-May	0	0	0	0	0	1	0
MAY	5	0	5	0	0	1	0
7-Jun	1	0	1	0	0	0	0
JUN	1	0	1	0	0	0	0
Total	30	0	30	0	0	1	0

Appendix Table 15. Daily spring Chinook salmon trapping data from the Upper Grande Ronde adult collection facility in 2015.

		Trapped				Sacrificed/mortality				Brood collected			
		Adults		Jacks		Adults		Jacks		Adults		Jacks	
Date	Total	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.
9-May	1	1	0	0	0	0	0	0	0	0	0	0	0
11-May	2	0	2	0	0	0	0	0	0	0	1	0	0
12-May	5	0	5	0	0	0	0	0	0	0	3	0	0
13-May	6	4	2	0	0	0	0	0	0	3	0	0	0
14-May	3	1	2	0	0	0	0	0	0	1	1	0	0
15-May	19	11	8	0	0	0	0	0	0	5	4	0	0
17-May	36	22	14	0	0	0	0	0	0	9	8	0	0
18-May	32	24	8	0	0	0	0	0	0	11	4	0	0
19-May	24	18	6	0	0	0	0	0	0	9	4	0	0
20-May	36	30	6	0	0	0	0	0	0	11	2	0	0
21-May	108	82	26	0	0	0	0	0	0	28	12	0	0
22-May	37	29	8	0	0	0	0	0	0	21	6	0	0
23-May	58	47	11	0	0	0	0	0	0	6	0	0	0
26-May	23	17	6	0	0	1	0	0	0	3	1	0	0
27-May	9	9	0	0	0	0	0	0	0	1	0	0	0
28-May	38	26	12	0	0	0	0	0	0	4	2	0	0
29-May	84	71	13	0	0	0	0	0	0	13	1	0	0
30-May	100	84	14	2	0	0	0	0	0	4	0	2	0
31-May	89	71	15	3	0	0	0	0	0	0	0	2	0
MAY	710	547	158	5	0	1	0	0	0	129	49	4	0
1-Jun	73	57	15	0	1	0	0	0	0	0	0	0	1
2-Jun	33	30	3	0	0	0	0	0	0	0	0	0	0
4-Jun	51	42	9	0	0	0	0	0	0	0	0	0	0
5-Jun	30	25	1	4	0	0	0	0	0	0	0	3	0
6-Jun	37	26	9	2	0	0	0	0	0	0	0	0	0
7-Jun	46	37	6	3	0	0	0	0	0	0	0	0	0
JUN	270	217	43	9	1	0	0	0	0	0	0	3	1
Total	980	764	201	14	1	1	0	0	0	129	49	7	1

Appendix Table 16. Daily summer steelhead trapping data from the Lookingglass Creek adult collection facility in 2015.

		Trapped		Sacrificed/mortality		Recaptures at trap	
DATE	TOTAL	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.
4-Mar	1	1	0	1	0	0	0
9-Mar	8	4	4	4	0	0	0
13-Mar	8	0	8	0	0	0	0
16-Mar	17	2	15	2	0	0	0
18-Mar	8	1	7	1	0	0	0
20-Mar	8	0	8	0	0	0	0
23-Mar	20	0	20	0	0	0	0
27-Mar	12	0	12	0	0	0	2
30-Mar	32	1	31	1	0	0	4
MAR	114	9	105	9	0	0	6
1-Apr	5	0	5	0	0	0	0
3-Apr	8	1	7	1	0	0	2
6-Apr	4	1	3	1	0	0	1
8-Apr	6	0	6	0	0	0	1
10-Apr	11	0	11	0	0	0	1
13-Apr	9	1	8	1	0	0	3
15-Apr	5	0	5	0	0	0	0
17-Apr	5	0	5	0	0	0	0
20-Apr	13	0	13	0	0	0	4
22-Apr	15	0	15	0	0	0	3
24-Apr	7	0	7	0	0	0	1
27-Apr	7	1	6	1	0	0	0
29-Apr	13	1	12	1	0	0	1
APR	108	5	103	5	0	0	17
1-May	9	0	9	0	0	0	1
4-May	23	1	22	1	0	0	2
6-May	7	0	7	0	0	0	0
8-May	3	0	3	0	0	0	0
11-May	8	0	8	0	0	0	1
13-May	12	0	12	0	0	0	1
15-May	1	0	1	0	0	0	0
18-May	3	0	3	0	0	0	2
19-May	6	0	6	0	0	0	0
21-May	7	0	7	0	0	0	0
22-May	2	0	2	0	0	0	0
MAY	81	1	80	1	0	0	7
9-Jun	1	0	1	0	0	0	0
10-Jun	1	0	1	0	0	0	0
JUN	2	0	2	0	0	0	0
Total	305	15	290	15	0	0	30

Appendix Table 17. Daily spring Chinook salmon trapping data from the Lookingglass Creek adult collection facility in 2015.

		Trapped				Sacrificed/mortality				Brood collected			
		Adults		Jacks		Adults		Jacks		Adults		Jacks	
Date	Total	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.
20-Apr	1	1	0	0	0	0	0	0	0	0	0	0	0
APR	1	1	0	0	0	0	0	0	0	0	0	0	0
1-May	1	1	0	0	0	0	0	0	0	0	0	0	0
4-May	2	2	0	0	0	0	0	0	0	0	0	0	0
6-May	1	1	0	0	0	0	0	0	0	1	0	0	0
8-May	5	5	0	0	0	0	0	0	0	2	0	0	0
11-May	5	5	0	0	0	0	0	0	0	3	0	0	0
13-May	29	22	7	0	0	0	0	0	0	7	5	0	0
15-May	9	6	3	0	0	0	0	0	0	3	2	0	0
18-May	35	32	2	0	1	0	0	0	0	13	0	0	0
19-May	47	32	13	2	0	0	0	0	0	0	4	0	0
20-May	10	9	1	0	0	0	0	0	0	0	0	0	0
21-May	43	32	9	1	1	0	0	1	0	0	0	0	0
22-May	14	11	3	0	0	0	0	0	0	11	3	0	0
26-May	63	50	13	0	0	0	0	0	0	6	8	0	0
27-May	31	23	7	0	1	0	0	0	0	0	0	0	0
29-May	62	43	16	1	2	0	0	0	0	10	10	0	0
MAY	357	274	74	4	5	0	0	1	0	56	32	0	0
1-Jun	111	59	45	4	3	0	0	0	0	16	0	2	0
2-Jun	41	24	13	0	4	0	0	0	0	0	0	0	0
3-Jun	59	41	12	4	2	0	0	0	0	1	0	0	0
4-Jun	71	45	22	4	0	0	0	0	0	0	0	0	0
5-Jun	24	15	8	1	0	0	0	0	0	0	0	0	0
8-Jun	60	44	5	9	2	0	0	0	0	4	0	0	0
9-Jun	59	36	8	12	3	0	0	0	0	9	3	0	0
10-Jun	69	34	17	14	4	0	0	0	0	0	2	2	0
12-Jun	39	20	6	11	2	0	0	1	0	0	1	0	0
15-Jun	21	11	6	2	2	0	0	1	0	0	1	0	0
17-Jun	31	17	5	9	0	0	0	7	0	3	2	0	0
18-Jun	5	3	0	1	1	0	0	1	0	0	0	0	0
22-Jun	18	13	4	0	1	0	0	0	0	1	0	0	0
24-Jun	26	11	1	12	2	0	0	7	0	2	1	4	0
26-Jun	7	5	0	2	0	0	0	2	0	2	0	0	0
29-Jun	11	3	2	6	0	0	0	4	0	2	2	1	0
JUN	652	381	154	91	26	0	0	23	0	40	12	9	0
2-Jul	6	1	0	5	0	0	0	2	0	1	0	2	0
6-Jul	1	0	0	1	0	0	0	1	0	0	0	0	0
8-Jul	2	1	0	1	0	0	0	1	0	1	0	0	0
10-Jul	1	0	1	0	0	0	0	0	0	0	1	0	0
17-Jul	1	1	0	0	0	0	0	0	0	0	0	0	0
20-Jul	1	0	0	1	0	0	0	1	0	0	0	0	0
27-Jul	3	2	0	1	0	0	0	1	0	2	0	0	0
JUL	15	5	1	9	0	0	0	6	0	4	1	2	0

Appendix Table 17 (cont.). Daily spring Chinook salmon trapping data from the Lookingglass Creek adult collection facility in 2015.

		Trapped				Sacrificed/mortality				Brood collected			
		Adults		Jacks		Adults		Jacks		Adults		Jacks	
Date	Total	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.	Hat.	Nat.
7-Aug	1	1	0	0	0	0	0	0	0	1	0	0	0
11-Aug	1	1	0	0	0	0	0	0	0	1	0	0	0
14-Aug	3	1	2	0	0	0	0	0	0	1	2	0	0
18-Aug	3	2	0	0	1	1	0	0	0	1	0	0	0
25-Aug	14	6	4	1	3	0	0	1	0	5	4	0	1
AUG	22	11	6	1	4	0	0	1	0	9	6	0	1
2-Sep	12	10	2	0	0	0	0	0	0	9	2	0	0
9-Sep	2	1	1	0	0	0	0	0	0	0	1	0	0
SEP	14	11	3	0	0	0	0	0	0	9	3	0	0
Total	1061	683	238	105	35	1	0	31	0	118	54	11	1

Appendix Table 18. Adult summer steelhead trapping summary from the Catherine Creek adult collection facility 1997-2015.

Year	Total	Trapped		Sacrificed/mortality		Recaptures at trap	
		Hat.	Nat.	Hat.	Nat.	Hat.	Nat.
1997	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0
1999	10	3	7	3	0	0	0
2000	15	6	9	0	0	0	0
2001	201	50	151	41	1	0	2
2002	256	1	255	1	0	0	4
2003	226	2	224	2	1	0	2
2004	180	0	180	0	0	0	7
2005	191	1	190	1	0	0	6
2006	171	0	171	0	0	0	5
2007	127	0	127	0	0	0	3
2008	121	0	121	0	0	0	3
2009	149	0	149	0	0	0	15
2010	298	3	295	3	0	0	10
2011	348	0	348	0	0	0	30
2012	329	0	329	0	0	0	13
2013	171	0	171	0	0	0	20
2014	263	0	263	0	0	0	17
2015	293	0	293	0	0	0	10

Appendix Table 19. Adult summer steelhead trapping summary from the Upper Grande Ronde River adult collection facility 1997-2015.

Year	Total	Trapped		Sacrificed/mortality		Recaptures at trap	
		Hat.	Nat.	Hat.	Nat.	Hat.	Nat.
1997	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0
1999	1	0	1	0	0	0	0
2000	0	0	0	0	0	0	0
2001	11	0	11	0	0	0	1
2002	36	0	36	0	0	0	3
2003	56	0	56	0	0	0	16
2004	63	0	63	0	0	0	10
2005	41	0	41	0	0	0	0
2006	1	0	1	0	0	0	0
2007	63	0	63	0	0	0	3
2008	31	0	31	0	0	0	6
2009	36	0	36	0	0	0	2
2010	15	0	15	0	0	0	0
2011	11	0	11	0	0	0	0
2012	13	0	13	0	0	0	2
2013	28	0	28	0	0	0	0
2014	8	0	8	0	0	0	1
2015	30	0	30	0	0	1	0

Appendix Table 20. Adult summer steelhead trapping summary from the Lookingglass Creek adult collection facility 1997-2015.

Year	Total	Trapped		Sacrificed/mortality		Recaptures at trap	
		Hat.	Nat.	Hat.	Nat.	Hat.	Nat.
1997	10	1	9	0	0	0	0
1998	15	4	11	0	0	0	1
1999	40	0	40	0	0	0	0
2000	11	0	11	0	0	0	0
2001	114	1	113	0	0	0	2
2002	260	2	258	2	0	1	42
2003	165	0	165	0	0	0	14
2004	136	3	133	3	0	0	16
2005	206	5	201	5	1	0	20
2006	196	3	193	3	0	0	18
2007	132	0	132	0	0	0	15
2008	135	6	129	6	0	0	8
2009	194	0	194	0	0	0	48
2010	334	23	311	5	0	9	12
2011	281	3	278	3	0	0	28
2012	276	1	275	1	0	0	41
2013	160	2	157	1	0	0	18
2014	182	2	180	2	0	0	20
2015	305	15	290	15	0	0	30

Appendix Table 21. Spawning data for Catherine Creek stock spring Chinook salmon at Lookingglass Hatchery 2001-2015.

		Fish spawned										Median	Mortality		
Year	Stock	NatF	HatF	NatM	recy	HatM	recy	NatJ	recy	HatJ	recy	Spawn wk	F	M	J
2001	CC	13	0	5		0		2		0		30-Aug	2	2	1
2002	CC	20	0	11		0		3		0		23-Aug	1	1	0
2003	CC	28	0	17		0		1		0		21-Aug	1	2	0
2004	CC	9	0	6		0		0		1		16-Sep	0	2	0
2005	CC	8	9	2		10		0		5		8-Sep	2	0	0
2006	CC	8	29	11		16		1		1		31-Aug	0	0	0
2007	CC	14	31	16	3	13	1	1		4		29-Aug	2	1	0
2008	CC	11	21	19	14	32	21	0		4		3-Sep	0	0	0
2009	CC	13	30	14	1	5		4		2		27-Aug	4	4	0
2010	CC	13	29	22	7	18	3	1		2		9-Sep	1	0	0
2011	CC	19	20	13	2	24	3	2		2		15-Sep	5	5	0
2012	CC	23	22	24	3	18		2		2		16-Aug	2	2	0
2013	CC	26	23	21	7	13	3	1		2		29-Aug	9	3	1
2014	CC	25	19	29	7	26	1	2		2		28-Aug	3	3	0
2015	CC	20	33	38	11	21	0	3		1		3-Sep	3	1	0

NatF=Natural Females, HatF=Natural Males, etc. Recy=number of fish that were spawned multiple times. These are included in the total. Example 2007: NatM=16 total males, recy=3 indicates that 3 of the 16 males spawned multiple times. There were 13 unique individuals. Median spawn wk=the week in which 50% of the females had spawned. Mortality=total mortality for the season.

Appendix Table 22. Spawning data for Grande Ronde stock spring Chinook salmon at Lookingglass Hatchery 2001-2015.

		Fish spawned										Median	Mortality		
Year	Stock	NatF	HatF	NatM	recy	HatM	recy	NatJ	recy	HatJ	recy	Spawn wk	F	M	J
2001	GR	8	0	7		0		0		0		5-Sep	2	3	0
2002	GR	21		14		0		1		0		23-Aug	6	3	0
2003	GR	23	0	20		0		0		0		28-Aug	16	11	0
2004	GR	7	0	5		0		0		1		9-Sep	1	2	1
2005	GR	2	38	4		24	6	0		5		1-Sep	3	4	0
2006	GR	13	71	14	2	50		2		1		7-Sep	4	15	0
2007	GR	6	25	10	2	14	1	0		7		11-Sep	1	4	1
2008	GR	4	8	10	5	11	6	0		5	2	3-Sep	0	1	0
2009	GR	9	52	10	2	30	1	1		9	1	13-Aug	37	28	4
2010	GR	14	68	23	6	63	6	1		0		2-Sep	5	12	1
2011	GR	2	37	8	4	32	3	2	1	1		1-Sep	17	4	0
2012	GR	27	47	40	3	32		1		5		30-Aug	8	10	2
2013	GR	13	53	7	14	31	3	0		8		29-Aug	8	3	1
2014	GR	22	46	34	3	42		2		3		28-Aug	5	13	6
2015	GR	23	62	22	6	68		1		5		3-Sep	12	5	1

NatF=Natural Females, HatF=Natural Males, etc. Recy=number of fish that were spawned multiple times. These are included in the total. Example 2006: NatM=14 total males, recy=2 indicates that 2 of the 14 males spawned multiple times. There were 12 unique individuals. Median spawn wk=the week in which 50% of the females had spawned. Mortality=total mortality for the season.

Appendix Table 23. Spawning data for Lookingglass Creek stock spring Chinook salmon at Lookingglass Hatchery 2004-2015.

		Fish spawned										Median	Mortality		
Year	Stock	NatF	HatF	NatM	recy	HatM	recy	NatJ	recy	HatJ	recy	Spawn wk	F	M	J
2004	LG	0	53	0		53		0		4		9-Sep	5	12	0
2005	LG	Fish were released above the hatchery													
2006	LG	Fish were released above the hatchery													
2007	LG	0	23	0		19	4	0		23		6-Sep	2	1	3
2008	LG	0	76	22	11	91	45	1		6	4	3-Sep	1	2	0
2009	LG	19	7	14	6	8	5	27		0		3-Sep	1	1	4
2010	LG	20	55	23		49	3	9		0		2-Sep	8	10	0
2011	LG	29	50	32	6	41	3	8		0		1-Sep	4	9	0
2012	LG	24	57	28		52	10	2		5		30-Aug	3	7	0
2013	LG	15	52	15	6	34	9	0		5		4-Sep	4	3	2
2014	LG	24	58	32	5	47	4	0		7		4-Sep	5	6	1
2015	LG	27	48	21	0	56	1	1		5		2-Sep	11	9	2

NatF=Natural Females, HatF=Natural Males, etc. Recy=number of fish that were spawned multiple times. These are included in the total. Example 2008: NatM=22 total males, recy=11 indicates that 11 of the 22 males spawned multiple times. There were 11 unique individuals. Median spawn wk=the week in which 50% of the females had spawned. Mortality=total mortality for the season.

Appendix Table 24. Bulltrout trapping summary from the Catherine Creek, Upper Grande Ronde, and Lookingglass Creek adult collection facilities 1999-2015.

Year	Catherine Creek	Grande Ronde	Lookingglass Creek
1999	1	0	47
2000	1	0	43
2001	1	0	39
2002	3	0	91
2003	5	0	45
2004	7	0	44
2005	5	0	60
2006	1	2	51
2007	5	0	59
2008	4	0	58
2009	14	0	34
2010	31	0	31
2011	35	0	78
2012	56	0	126
2013	52	1	177
2014	33	3	132
2015	30	4	82

Appendix Table 25. Median spawn dates and holding location at Lookingglass Hatchery for Catherine Creek, Grande Ronde, and Lookingglass Creek stocks 2001-2015.

Year	Catherine Creek (#fem.)	Grande Ronde (#fem.)	Lookingglass Creek (#fem.)
2001	8/30 (12) circular	9/5 (8) circular	--
2002	8/23 (20) circular	8/23 (21) circular	--
2003	8/21 (28) circular	8/28 (23) circular	--
2004	9/16 (9) circular	9/9 (7) circular	9/9 (53) raceway
2005	9/8 (17) circular	9/1 (40) circular	--
2006	8/31 (37) circular	9/7 (85) circular	--
2007	8/29 (45) raceway	9/11 (32) circular	9/6 (23) raceway
2008	9/3 (32) raceway	9/3 (12) circular	9/3 (76) raceway
2009	8/27 (43) raceway	8/13 (61) circular	9/3 (26) raceway
2010	9/9 (42) circular	9/2 (82) raceway	9/2 (75) raceway
2011	9/15 (39) circular	9/1 (39) raceway	9/1 (79) raceway
2012	8/16 (45) circular	8/30 (74) raceway	8/30 (81) raceway
2013	8/29 (49) circular	8/29 (66) raceway	9/4 (67) raceway
2014	8/28 (44) circular	8/28 (68) raceway	9/4 (82) raceway
2015	9/3 (53) circular	9/3 (85) raceway	9/2 (75) raceway

Appendix Table 26. Pecent egg viability for stocks of fish spawned at Lookingglass Hatchery (mean percent viability).

Year	Catherine Creek	Grande Ronde	Lookingglass Creek	Lostine	Imnaha
2007	85	81	77	87	74
2008	95	90	93	92	88
2009	93	87	98	96	93
2010	92	93	87	93	92
2011	93	86	90	92	85
2012	87	92	94	90	80
2013	84	92	92	89	92
2014	93	94	96	94	94
2015	89	90	94	89	93

Appendix Table 27. Trap install and removal dates.

	Catherine Creek		Grande Ronde		Lookingglass Creek	
Year	In	Out	In	Out	In	Out
1997	7/10	9/3	6/20	9/3	unk	unk
1998	6/9	9/30	5/16	7/23	unk	unk
1999	5/7	9/26	5/7	9/22	unk	unk
2000	3/30	7/31	3/24	7/31	unk	unk
2001	3/30	9/30	3/31	7/23	unk	unk
2002	3/12	8/13	4/22	7/24	unk	unk
2003	3/5	8/1	3/19	8/1	3/6	unk
2004	3/1	8/18	3/1	8/1	3/2	unk
2005	2/11	8/3	3/10	8/3	2/22	9/9
2006	3/1	7/25	3/3	7/25	3/8	unk
2007	3/1	7/31	3/1	7/13	4/2	9/18
2008	3/3	9/9	3/5	7/28	3/1	9/9
2009	3/2	9/2	3/12	8/4	3/2	9/10
2010	3/1	7/30	3/3	6/28	3/1	9/15
2011	3/3	8/5	3/2	7/20	2/28	9/12
2012	3/1	8/15	3/1	6/22	3/1	9/18
2013	2/21	7/31	3/6	6/18	3/1	9/11
2014	3/3	7/31	3/4	7/1	3/1	9/16
2015	3/2	7/29	3/2	6/7	3/1	9/18