HATCHERY AND GENETIC MANAGEMENT PLAN:
IMPLEMENTATION REPORT FOR
FALL 2017 – SPRING 2018

Hatchery Program:	Big Creek Hatchery Chum Salmon Recovery Program
Species or Hatchery Stock:	Chum Salmon (ODFW Stock 104)
Agency/Operator:	Oregon Department of Fish and Wildlife
Watershed and Region:	Lower Columbia River/Big Creek and other tributaries/Oregon
Submitted to NOAA:	January 23, 2013
Date Last Updated:	July 25, 2016

Review of program description in HGMP

1.1) Name of hatchery or program.
Big Creek Hatchery Chum Salmon Recovery Program.

1.2) Species and population (or stock) under propagation, and ESA status.
Chum Salmon *Oncorhynchus keta* (stock 104) originated from an integrated stock of Grays River wild-origin and hatchery-origin broodstock. On arrival of eyed eggs at Big Creek Hatchery in 2010 from Grays River Hatchery, ODFW assigned stock number 104 to this Chum Salmon stock. The Columbia River Chum Salmon was listed as Threatened ESU under the federal Endangered Species Act (ESA) in March 1999. The Grays River Hatchery stock is part of the Columbia River chum ESU and is listed under the ESA. Therefore, the Big Creek Hatchery stock of Chum Salmon (stock 104) originating from the Grays River stock is considered to be an ESA listed population.

Grays River Hatchery, Washington Department of Fish and Wildlife (WDFW) – This facility/location served as the original broodstock source for the Big Creek Hatchery Chum Salmon Program. The facility provided adult capture and holding, egg incubation, and otolith marking during the startup phase of this program. Although the intent is to establish a self-sustaining broodstock source in Oregon, the continued cooperation from WDFW Grays River Hatchery will remain a potential contributor to the program if necessary, as determined annually by broodstock needs and availability.

Introduction
The populations of Chum Salmon along the Oregon side of the lower Columbia River ESU include Young's Bay, Big Creek, Clatskanie River, Scappoose Creek, Clackamas River, Sandy River, Lower Gorge, and Upper Gorge (ODFW 2010). Multiple smaller tributaries that drain directly into the Lower Columbia River are part of these Chum Salmon populations. Although there may be some remnant Chum Salmon populations in the lower Columbia River, Chum Salmon are considered to be functionally extirpated from Oregon tributaries of the Columbia River Basin (McElhany et al. 2007; ODFW 2006), which provides a strong justification to operate this recovery program. Therefore, the current program is aimed at reintroduction and reestablishment of self-sustaining populations of Chum Salmon along the Oregon side of the lower Columbia River. The Big Creek Hatchery Chum Salmon Recovery Program is part of the Lower Columbia Chum Salmon reintroduction and recovery project. The program is intended to help recover self-sustaining Chum Salmon populations along the Oregon side of the Columbia River. Currently, this is an integrated recovery program incorporating natural origin fish in the broodstock. Natural origin Chum Salmon describe those unmarked individuals that enter Big Creek Hatchery volitionally. Because the Big Creek Population is currently considered functionally extirpated, incorporation of these individuals in the broodstock does not change the status of the Big Creek Population; it remains functionally extirpated.

In this report, I describe (1) the 2017 collection of Chum Salmon broodstock at Big Creek Hatchery, along with associated metrics (2) the 2018 fry releases from Big Creek Hatchery, (3)

take occurring through monitoring and reintroduction actions in fall 2017 and spring 2018, and (4) remaining performance indicators. No changes are proposed to the HGMP at this time.

Chum Salmon broodstock collection through fall 2017

Big Creek Hatchery operates an integrated Chum Salmon broodstock incorporating natural-origin fish with hatchery fish. Natural-origin Chum Salmon are unmarked individuals that enter Big Creek Hatchery volitionally. Marked (hatchery-origin) Chum Salmon may be marked with Coded Wire Tags (CWT), Adipose Clips (Ad-Clip), or Otolith Thermal Marks, or may be identifiable through Parentage-Based Tagging (PBT). The specific marks applied, by year, are listed in Table 1. Beginning in 2014, Chum Salmon have been spawned at Big Creek Hatchery and collected eggs have been used for the broodstock and for outplanting (Table 2). In fall 2017, a total of 63 Chum Salmon were collected at Big Creek Hatchery, including 8 individuals marked with a coded wire tag. Three unmarked Chum Salmon died before spawning (Table 3). Average fecundity generally decreased over the course of the spawning run (Table 4).

Table 1. Marks applied to the Big Creek Hatchery Chum Salmon *Oncorhynchus keta* broodstock 2010-2017, and years when marks are expected to be present in age 3-5 adult returns to the hatchery or spawning grounds. For brood years 2010- 2013 Otolith Thermal Marks were applied at the Grays River Hatchery, Coded Wire Tags (CWT) were implanted at Big Creek Hatchery, and Adipose Clips (Ad-Clip) and Parentage-Based Tagging (PBT) occurred at Big Creek Hatchery.

Brood year	Marks	Years marks observed in returns
2010	Pre-hatch thermal, CWT	2013-2015
2011	Pre-hatch thermal, CWT	2014-2016
2012	Pre-hatch thermal, CWT	2015-2017
2013	Pre-hatch thermal, CWT	2016-2018
2014	Pre and post-hatch thermal, CWT, Ad-Clip (test group)	2017-2019
2015	Pre and post-hatch thermal, Ad-Clip	2018-2020
2016	Pre and post-hatch thermal, Ad-Clip	2019-2021
2017	Pre and post-hatch thermal, PBT	2020-2022

Table 2. Number and origin of adult Chum Salmon *Oncorhynchus keta* collected for the Big Creek Hatchery broodstock, by brood year. Totals do not include mortalities or fish collected for outplanting of adults or eyed-eggs. *It is possible that a portion of the "unmarked" fish were actually marked fish that had lost their tag. This is being investigated currently through examination of thermal marks on otoliths collected from all spawned fish.

Brood Year	Males	Females	Total	% unmarked fish	% marked fish
2014	45	40	85	0	100
2015	87	87	174	32.2	67.8
2016	28	16	44	81.8	18.2*
2017	22	38	60	86.7	13.3*

Table 3. Weekly spawn totals of marked and unmarked Chum Salmon *Oncorhynchus keta* at Big Creek Hatchery. Individuals marked as Mortalities died at the hatchery prior to spawning.

	Unmarked				Marked			
	Spawned		Mortality		Spawned		Mortality	
Date	Males	Females	Males	Females	Males	Females	Males	Females
11/7/2017	6	10	0	0	3	1	0	0
11/14/2017	8	13	1	2	1	1	0	0
11/17/2017	2	4	0	0	0	0	0	0
11/22/2017	1	3	0	0	0	2	0	0
11/28/2017	1	4	0	0	0	0	0	0
Totals	**18**	**34**	**1**	**2**	**4**	**4**	**0**	**0**

Table 4. Weekly fecundity estimates of Chum Salmon *Oncorhynchus keta* spawned at Big Creek Hatchery. Fecundity estimates were combined for egg takes on November 14th and 17th because the fish that were spawned on the later date had arrived with the first group but were not yet ripe. Typically, fecundity data is collected on 33-50% of females due to time constraints during spawning. Total fecundity is presented based on expanding estimated fecundity (from pounds of eggs and eggs/ounce measurements) and based on the program average fecundity of 2,500 eggs/ female.

						Total eggs collected	
		Number	Fecundity			(estimated	(2,500 eggs/
Date	Week	females	Min	Max	Avg	fecundity)	female)
11/7/2017	1	11	2,473	3,414	2,894	31,832	27,500
11/14/2017	2	14	1,947	3,973	2,856	49,782	45,000
11/17/2017	2	4					
11/22/2017	3	5	1,764	3,199	2,662	13,312	12,500
11/28/2017	4	4	1,930	2,700	2,407	9,627	10,000
Totals	**4**	**38**	**1,764**	**3,973**	**2,739**	**104,553**	**94,500**

As all populations of Chum Salmon on the Oregon side of the Columbia River are considered functionally extirpated, integration of variable numbers of unmarked Chum Salmon into the broodstock does not impact the current status of naturally spawning Chum Salmon (i.e., populations remain functionally extirpated). In the HGMP, it states, "Naturally produced Chum will be integrated annually as available and as needed to meet the goals of the re-introduction program as long as their removal from the naturally spawning population does not jeopardize efforts to restore self-sustaining populations." In 2017, all unmarked Chum Salmon that volitionally returned to Big Creek Hatchery were incorporated in the broodstock (Tables 2 and 3). No maximum impact levels have been established for integration of natural origin fish at this time as Oregon donor populations are considered functionally extirpated.

Big Creek Hatchery Chum Salmon fry releases

The Big Creek Hatchery Chum Salmon program is permitted to collect up to 600,000 eggs for production needs through the approved HGMP. Of these, approximately 300,000 fry can be reared and marked at Big Creek Hatchery. Currently the release is approximately 200,000 fed fry. When sufficient brood is available, the release goal may increase to 300,000 fed fry. Releases have ranged from 37,725 fed fry during a poor return year to 192,147 fry (Table 5). In 2017, a total of 84,958 fed fry were released from Big Creek Hatchery using a release site located in a tidal area of Big Creek. The size of released fry has varied over time due to water temperature, whether fish are implanted with CWT or adipose clipped, and release strategy. In an effort to time releases more closely with wild Chum Salmon fry outmigration through the estuary, fry are now released earlier in the spring and at a smaller size.

Table 5. Number, date, location, and size of Chum Salmon *Oncorhynchus keta* fry released from Big Creek Hatchery by brood year.

Brood year	Release location	Stage	Total number	Release dates	Release size (Fish / pound)
2010	Big Creek, tidewater	Fed-fry	107,000	4/7/2011	224
2011	Big Creek, tidewater	Fed-fry	110,000	4/9/2012	218
2012	Big Creek, tidewater	Fed-fry	108,500	4/15/2013; 4/17/2013	168; 178
2013	Big Creek, tidewater/ Big Creek Hatchery	Fed-fry	101,000	4/17/2014	185
2014	Big Creek, tidewater	Fed-fry	190,188	4/24/2015; 5/15/2015	190; 180
2015	Big Creek hatchery	Fed-fry	192,147	4/25/2016	143
2016	Big Creek, tidewater	Fed-fry	37,725	4/17/2017	275
2017	Big Creek, tidewater	Fed-fry	84,958	3/29/18; 4/16/18	461; 401

Monitoring and Reintroduction actions

In 2017, Chum Salmon returns to Big Creek Hatchery were insufficient to conduct any reintroduction action beyond broodstock collection. As such, no adult outplanting, eyed-egg outplanting, or fry releases in recovery populations occurred. This was the second year in a row when no reintroduction actions occurred (Table 6).

Table 6. Overview of Chum Salmon *Oncorhynchus keta* adult outplanting and eyed-egg incubation in remote site incubators by brood year and location. Outplanting was done for two purposes: Supplementation (Suppl.) or Reintroduction (Reintro.)

Brood year	Release population	Release location	Stage	Purpose	Number			Release dates
					Males	Females	Eggs	
2010	Big Creek	Above Big Cr. Canyon	Adults	Suppl.	9	17		Fall
2011	Big Creek	Above Big Cr. Canyon	Adults	Suppl.	1	3		Fall
2012	Big Creek	Above Big Cr. Canyon	Adults	Suppl.	13	24		Fall
2013	Big Creek	Above Big Cr. Canyon	Adults	Suppl.	11	4		Fall
2013	Clatskanie R.	Graham Creek	Adults	Reintro.	12	10		Fall
2013	Clatskanie R.	Stewart Creek	Adults	Reintro.	11	10		Fall
2014	Big Creek	Above Big Cr. Canyon	Adults	Suppl.	64	65		Fall
2014	Clatskanie R.	Stewart Cr.	Adults	Reintro.	6	25		Fall
2014	Clatskanie R.	Perkins Cr.	Eyed-eggs	Reintro.			47,958	January
2015	Clatskanie R.	Stewart Cr.	Adults	Reintro.	7	10		Fall
2015	Clatskanie R.	Perkins Cr.	Eyed-eggs	Reintro.			56,947	January

Monitoring for adult returns and juvenile outmigration occurred in the Big Creek and Clatskanie River populations in support of recovery and reintroduction efforts. In fall 2017, a box and panel adult trap was operated on Stewart Creek, a tributary to Beaver Creek in the Clatskanie River population. This site was used for adult outplanting from 2013-2015 and we were expecting adult returns from those efforts to occur this year. An adult trap was operated from October 11 – December 21, 2017. The trap was checked daily and spawning surveys were conducted upstream and downstream of the trap. No fish were captured in the trap during the monitoring period.

In fall 2017, spawning ground surveys were also conducted throughout the Clatskanie River, Big Creek, and Youngs Bay populations. Surveys were done by staff from two ODFW projects- the Chum Reintroduction Project and the Oregon Adult Salmonid Inventory Sampling project (OASIS). A total of four Chum Salmon were observed by OASIS crews, and all four were spawning in the Lewis and Clark River. No Chum Salmon were observed on official surveys by Chum Reintroduction crews, however one was observed in Big Creek incidentally. Survey conditions were challenging in 2017. Several large rain events occurred during peak spawning in November, decreasing visibility and in many cases, precluding surveys.

In spring 2018, rotary screw traps were operated from February – June, 2018 on Bear Creek (Big Creek population) and the Clatskanie River (Clatskanie River population). Juvenile Coho Salmon, Chinook Salmon, and Chum Salmon were handled, marked, and released (Table 8), and all actions were well-within take limits in the HGMP. All individuals reported in Table 8 were unmarked, although it is possible some could have been hatchery fish with thermal marks but no fin marks.

Hatchery performance indicators

In 2017, rearing and fish health parameters were monitored to ensure that fish culture standards are met. No health issues occurred for the 2017 brood. Fish were ponded and subsequently split out in order to maintain acceptable densities. Water flows were monitored and adjusted to maintain an appropriate flow index. ODFW pathology examined the fish regularly and prior to transfer or release. Nothing was found during the monthly exams. A total of 8 fish were examined in March and 1 fish was examined in April (only 1 fish because the majority of the fish had been released in late March). March and April exams were both pre liberation exams. At the hatchery, water quality parameters and results were reported to Oregon Department of Environmental Quality in March and April. No violations of the permit occurred.

Table 7. Streams and reaches surveyed for Chum Salmon spawning in the Youngs Bay, Big Creek, and Clatskanie River populations, fall 2017.

Population	Survey Name	Reach ID	Segment	Miles	Chum Observed
Youngs Bay	Walford Johnson Cr	30040	2	0.37	0
Youngs Bay	Hortill Cr	30046	1	0.32	0
Youngs Bay	Lewis & Clark R	30049	1	0.62	0
Youngs Bay	Lewis & Clark R	30051	1	0.90	3
Youngs Bay	Loowit Cr	30052	2	0.70	0
Youngs Bay	Lewis & Clark R	30053	1	0.93	1
Youngs Bay	Shweeash Cr	30054	1	0.69	0
Youngs Bay	Lewis & Clark R	30055	2	1.12	0
Youngs Bay	Wallooskee R	30068	1	0.70	0
Youngs Bay	Wallooskee R	30068	2.1	1.57	0
Youngs Bay	Tucker Cr	30074	1	0.36	0
Youngs Bay	Klaskanine R, N Fk	30081	1	0.64	0
Youngs Bay	Klaskanine R, N Fk	30081.7	1	1.32	0
Youngs Bay	Klaskanine R, S Fk	30086.3	1	0.90	0
Youngs Bay	Klaskanine R, S Fk	30086.3	1	0.90	0
Youngs Bay	Klaskanine R, S Fk	30086.3	2	1.65	0
Big Creek	Mill Cr	30108	2	0.65	0
Big Creek	Little Bear Cr	30126	1	1.02	0
Big Creek	Little Bear Cr	30126	2	0.98	0
Big Creek	Bear Cr	30129	1	1.14	0
Big Creek	Little Cr	30171	3.1	0.98	0
Big Creek	Big Cr	30172	3	1.11	0
Big Creek	Big Cr	30172	3	1.11	0
Big Creek	Gnat Cr, Trib A	30198.5	1	0.88	0
Big Creek	Gnat Cr	30198.7	1	0.78	0
Clatskanie River	Plympton Cr	30239	2	1.03	0
Clatskanie River	Graham Cr	30261	2	0.53	0
Clatskanie River	Stewart Cr	NA	1	0.50	0
Clatskanie River	Graham Cr	30261	2	0.53	0
Clatskanie River	Clatskanie R	30283	1	1.12	0
Clatskanie River	Clatskanie R	30291	1	0.85	0
Clatskanie River	Beaver Cr	30336	2	1.10	0
Clatskanie River	Beaver Cr	30336	3	1.14	0
Clatskanie River	Fox Cr	30378	2	0.85	0

Table 8. Actual annual take of lower Columbia River listed salmonids due to Chum Salmon recovery program through broodstock collection, adult trapping, and juvenile trapping, October 2017 – June 2018.

Action	Lower Columbia Chinook		Columbia Chum		Lower Columbia Coho	
	Life stage	Estimated Annual take	Life stage	Estimated Annual take	Life stage	Estimated Annual take
Observe or harass						
Collect for transport			Adult	0		
Capture, handle, and release	Fry	120	Fry	2	Fry Smolt Adult	1,052 7,574 0
Capture, handle, tag/mark/tissue sample, and release	Fry Adult	941 0	Fry Adult	29 0	Fry Smolt Adult	1,825 3,231 0
Capture and remove (e.g., broodstock)			Adult	63		
Intentional lethal take			Fry	0		
Unintentional lethal take	Fry Adult	33 0	Fry Adult	1 0	Fry Smolt Adult	33 33 0
Other take (specify)						

Literature cited

McElhany, P., M. Chilcote, J. Myers, and R. Beamesderfer. 2007. Viability Status of Oregon Salmon and Steelhead Populations in the Willamette and Lower Columbia Basins Part 3: Columbia River Chum. Report prepared for the Oregon Department of Fish and Wildlife and the National Marine Fisheries Service.

Oregon Department of Fish and Wildlife. 2006. 2005 Oregon native fish status report. Volume II. Assessment methods and population results. Oregon Department of Fish and Wildlife, Salem, Oregon.

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