

Fisheries and Hatchery Management Plan (FHMP)

Appendices

Draft Final

Cowlitz Hydroelectric Project

FERC No. 2016

Tacoma Power

3628 S 35th Street

Tacoma, WA 98409

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FHMP APPENDICES

- Appendix A Big Table Dataset**
- Appendix B Transition Plans**
- Appendix C Summary of Data Gaps and Potential Future
Monitoring Needs**
- Appendix D White Paper - Fall Chinook Salmon
Broodstock Collection**

APPENDIX A: BIG TABLE DATASET

Big Table for Fall Chinook Salmon. Management metrics and ranges of means for the most recent five years for hatchery- and natural-origin data that are available from ISIT, RMIS, Tacoma Power, and WDFW and FHMP adult goals.

*Suggested recovery target for Stabilizing population.

Recovery Targets								Source(s) of Current Data	FHMP Adult Goal	
Lower Cowlitz River		Upper Cowlitz River								
3,000	1,000*	1,000*	1,000*	Hatchery		Natural				
Metrics				Min	Max	Min	Max			
Data to be Collected (Numbers)										
Mature Returns										
Totals	Total Survivors to Maturity			?		?			23,372	11,938
	Total Escapement to Cowlitz River			?		?			7,606	9,017
Harvest	Fishery Location	Ocean	Commercial Fishery	?		?				
			Tribal Fishery	?		?				
			Sport Fishery	?		?				
			Total Ocean	7,157		4,542		ISIT	7,044	4,292
		Columbia River	Commercial Fishery	?		?				
			Tribal Fishery	?		?				
			Sport Fishery	?		?				
			Total Columbia River	3,170		1,923		ISIT	3,122	1,818
		Lower Cowlitz River	Commercial Fishery	?		?				
			Tribal Fishery	?		?				
			Sport Fishery	2,527		189		ISIT		
			Total Lower Cowlitz River	2,527		189		ISIT	2,527	189
		Above Mayfield Dam	Cispus River	?		?				
			Upper Cowlitz River	209		0		ISIT		
			Tilton River	208		142		ISIT		
			Total Above Mayfield Dam	417		143		ISIT	417	143
	Fishery Type	Commercial		?		?				
Tribal		?		?						
Sport		?		?						
Total Harvest				13,271		6,797		ISIT	13,110	6,441

Stray -ing	Stray Origin	Cowlitz River	Outside Cowlitz Basin		?		?		0	0		
		Population	In Cowlitz Basin		?		?		0	0		
		Other Population Strays in Cowlitz River			?		?		0	0		
Trapping	Lower Cowlitz Subbasin Tributary Traps	Delameter Creek	Released Below Weir	?		?				0		
			Released Above Weir	?		?						
			Kept for Broodstock	?		?						
			Mortalities	?		?			0	0		
			Killed	?		?				0		
			Total Caught	?		?						
		Lacamas Creek	Released Below Weir	?		?				0		
			Released Above Weir	?		?						
			Kept for Broodstock	?		?						
			Mortalities	?		?			0	0		
			Killed	?		?				0		
			Total Caught	?		?						
		Olequa Creek	Released Below Weir	?		?				0		
			Released Above Weir	?		?						
			Kept for Broodstock	?		?						
			Mortalities	?		?			0	0		
			Killed	?		?				0		
			Total Caught	?		?						
		Ostrander Creek	Released Below Weir	?		?				0		
			Released Above Weir	?		?						
			Kept for Broodstock	?		?						
			Mortalities	?		?			0	0		
			Killed	?		?				0		
			Total Caught	?		?						
	Cowlitz Salmon Hatchery	Hatchery Broodstock Collected			1,634	1,821	0	79	ISIT, TPU, WDFW	1,845	2,254	
		Released Below Dams			0	204	0	11	TPU, WDFW	0	0	
		Released Above Dams	Upper Cowlitz Subbasin			1,381	1,640	3	62	ISIT, TPU, WDFW	0	0
			Tilton Subbasin			809	3,502	2,631	2,693	TPU, WDFW	2,268	4,115
		Mortalities			1	167	1	20	TPU, WDFW	<10%	<10%	
		Surplus (Food Bank, Outplant, Nutrient Enhancement, etc)			658	709	0	0	TPU, WDFW	0	0	
		Total			4,322	7,097	2,776	2,808	TPU, WDFW	4,570	7,077	

Nature (pre-spawning)	Location	Below Dams	Lower Cowlitz River	Cowlitz River	1,203		3,317		ISIT	1,429	3,333	
				Out-of-Program Strays	?	?	?	?		0	0	
		Above Dams	Upper Cowlitz/Cispus Rivers			1,296		2		ISIT	1,100	0
			Tilton River			647		2,165			1,429	3,333
		Total				3,146		5,485		ISIT	2,857	6,667
Hatchery Production												
Spawners	Integrated Hatchery Program	Prespawn Mortalities			?	?	?	?		<92	<113	
		Killed, Not Spawned			?	?	?	?		0	0	
		Spawned			?	?	?	?		1,753	2,142	
	Segregated Hatchery Program	Prespawn Mortalities			?	?	?	?		0	0	
		Killed, Not Spawned			?	?	?	?		0	0	
		Spawned			?	?	?	?		750	0	
	Total Hatchery	Prespawn Mortalities			156	234	6	27	ISIT, WDFW	<92	<113	
		Killed, Not Spawned			?	?		?		0	0	
		Spawned			1,435	1,628	60	228	ISIT, WDFW	1,753	2,142	
Offspring - Rearing and Release	Integrated Hatchery Program	Green Eggs Collected (Fecundity)		Mean	?	?	?	?		2,289	2,289	
				Total	?	?	?	?		4,456,856		
		Eyed Eggs (Eyed Fecundity)		Mean	?	?	?	?		2,081	2,081	
				Total	?	?	?	?		4,051,688		
				Released	?	?	?	?		0	0	
		Fry	Fry Produced	Number	?	?	?	?		3,858,750		
				Size	?	?	NA	NA		?		
			Fry Released	Number	?	?	NA	NA		0		
				Size	?	?	NA	NA		NA		
		Parr	Parr Produced	Number	?	?	NA	NA		3,675,000		
				Size	?	?	NA	NA		?		
			Parr Released	Number	?	?	NA	NA		0		
				Size	?	?	NA	NA		NA		
		Smolts	Smolts Produced	Number	?	?	NA	NA		3,500,000		
				Size	?	?	NA	NA		?		
			Smolts Released	Number	484,927	1,257,737	NA	NA	ISIT, WDFW	3,500,000		
				Size	?	?	NA	NA		?		
		Total Offspring Released				484,927	1,257,737	NA	NA	ISIT, WDFW	3,500,000	
		Marks and Tags	Type: CWT	Number	?					700,000		

Offspring - Rearing and Release	Segregated Hatchery Program			Green Eggs Collected (Fecundity)		Mean	?	?	NA			0	NA			
				Total			?	?	NA			0				
				Eyed Eggs (Eyed Fecundity)			Mean		?	?	NA			0	NA	
							Total		?	?	NA			0		
							Released		?	?	NA			0	NA	
				Fry			Fry Produced		Number		?	?	NA			0
									Size		?	?	NA			?
							Fry Released		Number		?	?	NA			0
									Size		?	?	NA			?
				Parr			Parr Produced		Number		?	?	NA			0
									Size		?	?	NA			?
							Parr Released		Number		?	?	NA			0
									Size		?	?	NA			?
				Smolts			Smolts Produced		Number		?	?	NA			0
									Size		?	?	NA			?
							Smolts Released		Number		2,459,056	2,464,983	NA		ISIT, WDFW	0
									Size		?	?	NA			?
				Total Offspring Released				2,459,056	2,464,983	NA		ISIT, WDFW	NA			
				Marks and Tags		Type: CWT	Number	795,610		NA		RMIS	0			
				Total Hatchery Programs			Green Eggs Collected (Fecundity)		Mean		8,828				WDFW	
Total		4,013,974	4,121,383						146,209	572,528	ISIT, WDFW		4,456,856			
Eyed Eggs (Eyed Fecundity)			Mean				?	?	?	?			2,081	2,081		
			Total				?	?	?	?			4,051,688			
			Released				?	?	?	?			0	0		
Fry			Fry Produced				Number		?	?	NA		3,858,750			
							Size		?	?	NA		?			
			Fry Released				Number		?	?	NA		0			
							Size		?	?	NA		NA			
Parr			Parr Produced				Number		?	?	NA		3,675,000			
							Size		?	?	NA		?			
			Parr Released				Number		?	?	NA		0			
							Size		?	?	NA		?			
Smolts			Age-2 Smolts Produced				Number		?	?	NA		3,500,000			
							Size		?	?	NA		?			
			Age-2 Smolts Released				Number		2,937,151	2,962,151	NA		ISIT, WDFW	3,500,000		
					Size		?	?	NA		?					
Total Offspring Released				2,937,151	2,962,151	NA		ISIT, WDFW	3,500,000							
Marks and Tags		Type: CWT	Number	795,610		NA		RMIS	700,000							

Natural Production													
Below Dams	Lower Cowlitz River Mainstem	Spawners	Prespawn Mortalities in Nature	Lower Cowlitz River	?	?	?	?		<176	<333		
				Out-of-Program Strays	?	?	?	?		0	0		
			Spawners in Nature	Lower Cowlitz River	1,082		2,986		ISIT	1,286	3,000		
				Out-of-Basin Strays	?	?	?	?		0	0		
		Offspring	Total Eggs Laid			?	?	?	?		?	?	
			Smolts Produced			?					NA	60,000	
			Smolts Trapped & Released	Number Trapped			NA					NA	NA
				Number Released			NA					NA	NA
				Type of Mark/Tag			NA					NA	NA
				Number Marked/Tagged			NA					NA	NA
		Lower Cowlitz River Tributaries	Spawners	Prespawn Mortalities in Nature	Lower Cowlitz River	?	?	?	?		0	0	
					Out-of-Program Strays	?	?	?	?		0	0	
				Spawners in Nature	Lower Cowlitz River	?	?	?	?		0	0	
					Out-of-Basin Strays	?	?	?	?		0	0	
	Offspring		Total Eggs Laid			?	?	?	?		0	0	
			Smolts Produced			?					0	0	
			Smolts Trapped & Released	Number Trapped			NA					NA	NA
				Number Released			NA					NA	NA
				Type of Mark/Tag			NA					NA	NA
				Number Marked/Tagged			NA					NA	NA
Above Dams	Cispus River	Spawners	Prespawn Mortalities in Nature	Cispus River	?		?			0	0		
				Out-of-Program Strays	?		?			0	0		
			Spawners in Nature	Cispus River	?		?			0	0		
				Out-of-Basin Strays	?		?			0	0		

Above Dams	Cispus River	Offspring	Total Eggs Laid	?	?		0	0		
			Smolts Produced	?			NA	0		
			Smolts Trapped & Released	Number Trapped	?			NA	0	
				Number Released	?	?		NA	0	
				Type of Mark/Tag	?	?		NA	NA	
				Number Marked/Tagged	?	?		NA	0	
				Upper Cowlitz River	Spawners	Prespawn Mortalities in Nature	Upper Cowlitz River	?	?	
		Out-of-Program Strays	?			?		0	0	
	Spawners in Nature	Upper Cowlitz River	?			?		0	0	
			Out-of-Program Strays			?	?		0	0
		Total Eggs Laid	?			?		0	0	
	Offspring	Smolts Produced	55,150			CFFF (TPU/WDFW)	NA	0		
		Smolts Trapped & Released	Number Trapped		2,188			CFFF (TPU/WDFW)	NA	0
			Number Released		?				NA	0
			Type of Mark/Tag		NA				NA	NA
			Number Marked/Tagged		?				NA	0
			Tilton River		Spawners	Prespawn Mortalities in Nature	Tilton River	?	?	
		Out-of-Program Strays		?		?		0	0	
	Spawners in Nature	Tilton River		?		?		1,286	>3,000	
				Out-of-Program Strays		?	?		0	0
		Total Eggs Laid		?		?		?	?	
	Offspring	Smolts Produced		?				NA	>88,000	
		Smolts Trapped & Released		Number Trapped	45,396			TPU Mayfield	NA	>66,000
				Number Released	?				NA	>66,000
				Type of Mark/Tag	NA				NA	CWT
				Number Marked/Tagged	0				NA	>66,000

Above Dams	Total	Spawners	Prespawn	Tilton River	?	?		<129	<300
			Mortalities in Nature	Out-of-Program Strays	?	?		0	0
		Spawners in Nature		Tilton River	?	?		1,286	>3,000
				Out-of-Program Strays	?	?		0	0
		Total Eggs Laid		?	?		?	?	
	Offspring	Smolts Produced		>55,150		Mayfield / CFFF	NA	>88,000	
		Smolts Trapped & Released	Number Trapped		47,584		Mayfield / CFFF	NA	>66,000
			Number Released		?			NA	>66,000
			Type of Mark/Tag		NA			NA	CWT
			Number Marked/Tagged		0		TPU, RMIS	NA	>66,000
Smolt Migration									
Smolts	Location	Number of Smolts in Lower Cowlitz River	Lower Cowlitz River		?	?		3,500,000	60,000
			Cispus River		?	?		0	0
			Upper Cowlitz River		?	?		0	0
			Tilton River		?	?		0	66,000
			Total		?	?		3,500,000	126,000
		Number of Smolts at Mouth of Cowlitz River	Lower Cowlitz River		?	?		?	?
			Cispus River		?	?		?	?
			Upper Cowlitz River		?	?		?	?
			Tilton River		?	?		?	?
			Total		?	?		?	?
		Number of Smolts in Columbia River Estuary	Lower Cowlitz River		?	?		?	?
			Cispus River		?	?		?	?
			Upper Cowlitz River		?	?		?	?
			Tilton River		?	?		?	?
			Total		?	?		?	?
Management Metrics (Rates to be Calculated Using the Data Collected Above)									
Adult Salmon	Harvest Rate	Ocean	Commercial		?	?	?	?	?
			Tribal		?	?	?	?	?
			Sport		?	?	?	?	?
			Total Ocean		35.1%	34.7%	ISIT	?	?
		Columbia River	Commercial		?	?	?	?	?
			Tribal		?	?	?	?	?
			Sport		?	?	?	?	?
			Total Columbia River		15.3%	14.5%	ISIT	?	?

Adult Salmon	Harvest Rate	Cowlitz River	Lower Cowlitz River	Commercial	?	?	?	?		?	?
				Tribal	?	?	?	?		?	?
				Sport	14.2%		1.5%		ISIT	?	?
				Total Cowlitz River	14.2%		1.5%		ISIT	?	?
		Above Mayfield Dam - Sport		Upper Cowlitz Subbasin	0.8%		0.0%		ISIT	?	?
				Tilton Subbasin	1.3%		1.1%		ISIT	?	?
				Total Above Mayfield Dam	2.1%		1.1%		ISIT	?	?
		Total Harvest		Commercial	?	?	?	?		?	?
				Tribal	?	?	?	?		?	?
				Sport	?	?	?	?		?	?
				Total	66.7%		51.8%		ISIT	?	?
	Stray Rate	Cowlitz River Salmon	Out-of-Basin		?		?			<5%	<5%
			Cowlitz Basin		?		?			<5%	<5%
			Total		?		?			<5%	<5%
		Out-of-Basin Strays Into Cowlitz River			?		?			<5%	<5%
	Trapped at Barrier Dam	Lower Cowlitz River	Trapping Rate (% of Returns to Cowlitz River)		?	?	NA			NA	NA
				Hatchery Broodstock	?	?	NA			NA	NA
			Percentage of Cowlitz Salmon Hatchery Collection	Released Below Dams	?	?	NA			NA	NA
				Released Above Dams	?	?	NA			NA	NA
				Mortalities	?	?	NA			NA	NA
				Surplus	?	?	NA			NA	NA
		Tilton River	Trapping Rate (% of Returns to Cowlitz River)		?	?	?	?		NA	NA
				Hatchery Broodstock	?	?	?	?		NA	NA
			Percentage of Cowlitz Salmon Hatchery Collection	Released Below Dams	?	?	?	?		NA	NA
				Released Above Dams	?	?	?	?		NA	NA
				Mortalities	?	?	?	?		NA	NA
				Surplus	?	?	?	?		NA	NA

Adult Salmon	Trapped at Barrier Dam	Upper Cowlitz Subbasin	Trapping Rate (% of Returns to Cowlitz River)		?		?			?	?
			Percentage of Cowlitz Salmon Hatchery Collection	Hatchery Broodstock	?	?		?	?		
				Released Below Dams	?	?		?	?		
				Released Above Dams	?	?		?	?		
				Mortalities	?	?		?	?		
				Surplus	?	?		?	?		
				Total	Trapping Rate (% of Returns to Cowlitz River)		25.3%	45.3%	21.7%	21.9%	ISIT, TPU, WDFW. Reports
		Percentage of Cowlitz Salmon Hatchery Collection	Hatchery Broodstock		27.1%	52.4%	4.2%	4.2%	ISIT, TPU, WDFW. Reports	?	?
			Released Below Dams		0.0%	3.6%	0.0%	0.6%	ISIT, TPU, WDFW. Reports	?	?
			To Tilton Subbasin		18.9%	28.8%	0.1%	1.9%	ISIT, TPU, WDFW. Reports	?	?
			To Upper Cowlitz Subbasin		17.7%	49.7%	92.8%	95.7%	ISIT, TPU, WDFW. Reports	?	?
			Mortalities		0.0%	4.8%	0.0%	0.7%	ISIT, TPU, WDFW. Reports	?	?
			Surplus		1.0%	1.2%	0.0%	0.0%	ISIT, TPU, WDFW. Reports	?	?
	Age (Run Year - Brood Year)	Integrated Hatchery Program	Mean Age		?		NA			4.5	NA
			Age Composition (proportion)	Age-2	?	NA		0%	NA		
				Age-3	?	NA		5%	NA		
				Age-4	?	NA		50%	NA		
				Age-5	?	NA		35%	NA		
				Age-6	?	NA		8%	NA		
				Age-7	?	NA		2%	NA		
		Segregated Hatchery Program	Mean Age		?		NA			NA	NA
			Age Composition (proportion)	Age-2	?	NA		NA	NA		
				Age-3	?	NA		NA	NA		
				Age-4	?	NA		NA	NA		
				Age-5	?	NA		NA	NA		
				Age-6	?	NA		NA	NA		
				Age-7	?	NA		NA	NA		

Adult Salmon	Age (Run Year - Brood Year)	Total Hatchery	Mean Age	3.16	NA	RMIS	4.5	NA
			Age-2	0.000	NA	RMIS	0%	NA
			Age-3	0.146	NA	RMIS	5%	NA
			Age-4	0.572	NA	RMIS	50%	NA
			Age-5	0.253	NA	RMIS	35%	NA
			Age-6	0.029	NA	RMIS	8%	NA
			Age-7	0.000	NA	RMIS	2%	NA
		Lower Cowlitz Subbasin Natural-origin	Mean Age	NA	?		NA	NA
			Age-2	NA	?		NA	NA
			Age-3	NA	?		NA	NA
			Age-4	NA	?		NA	NA
			Age-5	NA	?		NA	NA
			Age-6	NA	?		NA	NA
			Age-7	NA	?		NA	NA
		Upper Cowlitz Subbasin Natural-origin	Mean Age	NA	?		NA	4.5
			Age-2	NA	?		NA	0%
			Age-3	NA	?		NA	5%
			Age-4	NA	?		NA	50%
			Age-5	NA	?		NA	35%
			Age-6	NA	?		NA	8%
			Age-7	NA	?		NA	2%
		Tilton Subbasin Natural-origin	Mean Age	NA	?		NA	NA
			Age-2	NA	?		NA	NA
			Age-3	NA	?		NA	NA
			Age-4	NA	?		NA	NA
			Age-5	NA	?		NA	NA
			Age-6	NA	?		NA	NA
			Age-7	NA	?		NA	NA
		Total Natural-origin	Mean Age	NA	?		NA	4.5
			Age-2	NA	?		NA	0%
			Age-3	NA	?		NA	5%
			Age-4	NA	?		NA	50%
			Age-5	NA	?		NA	35%
			Age-6	NA	?		NA	8%
			Age-7	NA	?		NA	2%

Spawning	In Hatchery	Integrated Hatchery Program	Prespawn Mortality Rate	?	?		<5%	<5%
			Mean Fecundity	?	?		4,500	4,500
			Mean Eyed Fecundity	?	?		4,275	4,275
			Fertility	?	?		95%	95%
		Segregated Hatchery Program	Prespawn Mortality Rate	?	?	ISIT	NA	NA
			Mean Fecundity	?	?		NA	NA
			Mean Eyed Fecundity	?	?		NA	NA
			Fertility	?	?		NA	NA
		Total Hatchery	Prespawn Mortality Rate	8.7-14.7%		ISIT, WDFW	<5%	<5%
			Mean Fecundity	844-4,728		ISIT, WDFW	4,500	4,500
			Mean Eyed Fecundity	?	?		4,275	4,275
			Fertility	?	?		95%	95%
	In Nature	Lower Cowlitz River	Prespawn Mortality Rate	?	?		NA	NA
			Mean Fecundity	?	?		NA	NA
		Cispus River	Prespawn Mortality Rate	?	?		NA	NA
			Mean Fecundity	?	?		NA	NA
		Upper Cowlitz River / Subbasin	Prespawn Mortality Rate	?	?		NA	NA
			Mean Fecundity	?	?		NA	NA
		Tilton River	Prespawn Mortality Rate	?	?		<5%	<5%
			Mean Fecundity	?	?		4,500	4,500
Survival of Offspring to Smolt Stage	In Hatchery	Integrated Hatchery Program	Fertility Rate	?	?		95%	NA
			Eyed Egg-to-Fry Survival	?	NA		95%	NA
			Fry-to-Parr Survival	?	NA		95%	NA
			Parr-to-Smolt Survival	?	NA		95%	NA
			Green Egg-to-Smolt Survival	?	NA		81%	NA
		Segregated Hatchery Program	Fertility Rate	?	?		95%	NA
			Eyed Egg-to-Fry Survival	?	NA		95%	NA
			Fry-to-Parr Survival	?	NA		95%	NA
			Parr-to-Smolt Survival	?	NA		95%	NA
			Green Egg-to-Smolt Survival	?	NA		81%	NA
		Total Hatchery	Fertility Rate	?	?		95%	NA
			Eyed Egg-to-Fry Survival	?	NA		95%	NA
			Fry-to-Parr Survival	?	NA		95%	NA
			Parr-to-Smolt Survival	?	NA		95%	NA
			Green Egg-to-Smolt Survival	68.6% - 70.9%		ISIT, WDFW	81%	NA

Survival of Offspring to Smolt Stage	In Nature	Lower Cowlitz River	Green Egg-to-Smolt Survival	NA	?		NA	?
		Cispus River	Green Egg-to-Smolt Survival	NA	?		NA	?
		Upper Cowlitz River / Subbasin	Green Egg-to-Smolt Survival	NA	?		NA	?
		Tilton River	Green Egg-to-Smolt Survival	NA	?		NA	?
	Marking / Tagging Rate	Hatchery-origin	Integrated Hatchery Program	?	NA		?	NA
			Segregated Hatchery Program	?	NA		?	NA
			Total Hatchery	21.5%	NA	RMIS/WDFW	?	NA
		Natural-origin	Lower Cowlitz River	NA	?		?	NA
			Cispus River	NA	?		?	NA
			Upper Cowlitz River / Subbasin	NA	?		?	NA
			Tilton River	NA	?		?	NA
Survival to Maturity	Integrated Hatchery Program	Smolt Survival	to Mouth of Cowlitz River	?	NA		?	NA
			to Columbia River Estuary	?	NA		?	NA
		Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?	NA		?	NA
			Parr	?	NA		?	NA
			Smolts	?	NA		0.11%	NA
		Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?	NA		?	NA
			Parr	?	NA		?	NA
			Smolts	?	NA		0.67%	NA
		Productivity (Recruits / Spawner)	Smolts / Female Spawner	?	NA		449	NA
			Smolts / Adult+Jack Spawner	?	NA		899	NA
			Female-to-Female	?	NA		>>1	NA
			Adult-to-Adult	?	NA		>>1	NA
			Adult+Jack-to-Adult+Jack	?	NA		>>1	NA
			Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA		>>1	NA

Survival to Maturity

Segregated Hatchery Program	Smolt Survival	to Mouth of Cowlitz River	?		NA		NA	NA	
		to Columbia River Estuary	?		NA		NA	NA	
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?		NA		NA	NA	
		Parr	?		NA		NA	NA	
		Smolts	?		NA		NA	NA	
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?		NA		NA	NA	
		Parr	?		NA		NA	NA	
		Smolts	?		NA		NA	NA	
	Productivity (Recruits / Spawner)	Smolts / Female Spawner		?		NA		NA	NA
		Smolts / Adult+Jack Spawner		?		NA		NA	NA
		Female-to-Female		?		NA		NA	NA
		Adult-to-Adult		?		NA		NA	NA
Adult+Jack-to-Adult+Jack		?		NA		NA	NA		
Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack		?		NA		NA	NA		

Total Hatchery	Smolt Survival	to Mouth of Cowlitz River	?		NA		?	NA	
		to Columbia River Estuary	?		NA		?	NA	
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?		NA		?	NA	
		Parr	?		NA		?	NA	
		Smolts	0.043%		NA	RMIS	0.11%	NA	
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?		NA		?	NA	
		Parr	?		NA		?	NA	
		Smolts	0.074%		NA	RMIS	0.67%	NA	
	Productivity (Recruits / Spawner)	Smolts / Female Spawner		3,370	3,462	NA	ISIT, WDFW	449	NA
		Smolts / Adult+Jack Spawner		1,761	1,793	NA	ISIT, WDFW	899	NA
		Female-to-Female		?		NA		>>1	NA
		Adult-to-Adult		?		NA		>>1	NA
Adult+Jack-to-Adult+Jack		?		NA		>>1	NA		
Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack		?		NA		>>1	NA		

Survival to Maturity

Lower Cowlitz River Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	NA		NA	NA
	Smolt Passage (Transport) Survival	NA	NA		NA	NA
	Smolt Survival to Mouth of Cowlitz River	NA	?		NA	?
	Smolt Survival to Columbia River Estuary	NA	?		NA	?
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	?
	Parr	NA	?		NA	?
	Smolts	NA	?		NA	?
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	?
	Parr	NA	?		NA	?
	Smolts	NA	?		NA	?
	Smolts / Female Spawner	?	NA		NA	?
	Smolts / Adult+Jack Spawner	?	NA		NA	?
	Productivity (Recruits / Spawner) Female-to-Female	?	NA		NA	>1
	Adult-to-Adult	?	NA		NA	>1
	Adult+Jack-to-Adult+Jack	?	NA		NA	>1
	Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA		NA	>1
Cispus River Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	?		NA	NA
	Smolt Passage (Transport) Survival	NA	?		NA	NA
	Smolt Survival to Mouth of Cowlitz River	NA	?		NA	NA
	Smolt Survival to Columbia River Estuary	NA	?		NA	NA
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	NA
	Parr	NA	?		NA	NA
	Smolts	NA	?		NA	NA
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	NA
	Parr	NA	?		NA	NA
	Smolts	NA	?		NA	NA
	Smolts / Female Spawner	?	NA		NA	NA
	Smolts / Adult+Jack Spawner	?	NA		NA	NA
	Productivity (Recruits / Spawner) Female-to-Female	?	NA		NA	NA
	Adult-to-Adult	?	NA		NA	NA
	Adult+Jack-to-Adult+Jack	?	NA		NA	NA
	Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA		NA	NA

Survival to Maturity	Upper Cowlitz River/ Subbasin Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	5.8%	CFFF (TPU/WDFW)	NA	NA
		Smolt Passage (Transport) Survival	NA	?		NA	NA
		Smolt Survival to Mouth of Cowlitz River	NA	?		NA	NA
		Smolt Survival to Columbia River Estuary	NA	?		NA	NA
		Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	NA
		Parr	NA	?		NA	NA
		Smolts	NA	?		NA	NA
		Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	NA
		Parr	NA	?		NA	NA
		Smolts	NA	?		NA	NA
		Smolts / Female Spawner	?	NA		NA	NA
		Smolts / Adult+Jack Spawner	?	NA		NA	NA
		Productivity (Recruits / Spawner) Female-to-Female	?	NA		NA	NA
		Adult-to-Adult	?	NA		NA	NA
		Adult+Jack-to-Adult+Jack	?	NA		NA	NA
		Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA		NA	NA
	Tilton River Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	?		NA	>75%
		Smolt Passage (Transport) Survival	NA	?		NA	>99%
		Smolt Survival to Mouth of Cowlitz River	NA	?		NA	?
		Smolt Survival to Columbia River Estuary	NA	?		NA	?
		Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	?
		Parr	NA	?		NA	?
		Smolts	NA	?		NA	?
		Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	?
		Parr	NA	?		NA	?
		Smolts	NA	?		NA	?
		Smolts / Female Spawner	NA	?		NA	?
		Smolts / Adult+Jack Spawner	NA	?		NA	?
		Productivity (Recruits / Spawner) Female-to-Female	NA	?		NA	>1
		Adult-to-Adult	NA	?		NA	>1
		Adult+Jack-to-Adult+Jack	NA	?		NA	>1
		Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	NA	?		NA	>1

Proportional Natural Influence	Lower Cowlitz River	Collected/ Released	pHOS	0.260	ISIT	<0.3
			pNOB	NA		NA
			PNI	NA		NA
		Actual Spawners	pHOS	0.260	ISIT	<0.3
			pNOB	0.072	ISIT	>0.5
			PNI	0.190	ISIT	>0.63
	Cispus River	Collected/ Released	pHOS	?		NA
			pNOB	?		NA
			PNI	?		NA
		Actual Spawners	pHOS	?		NA
			pNOB	?		NA
			PNI	?		NA
	Upper Cowlitz River/Subbasin	Collected/ Released	pHOS	0.972 - 1	TPU, WDFW	NA
			pNOB	NA		NA
			PNI	NA		NA
		Actual Spawners	pHOS	?		NA
			pNOB	?		NA
			PNI	?		NA
	Tilton River	Collected/ Released	pHOS	0.196 - 0.210	TPU, WDFW	<0.3
			pNOB	NA		>0.5
			PNI	NA		>0.63
		Actual Spawners	pHOS	?		<0.3
			pNOB	?		>0.5
			PNI	?		>0.63
	Total	Collected/ Released	pHOS	0.152 - 0.530	ISIT, TPU, WDFW	<0.3
			pNOB	0 - 0.185	ISIT, TPU, WDFW	>0.5
			PNI	0.550	ISIT, TPU, WDFW	>0.63
		Actual Spawners	pHOS	0.260	ISIT	<0.3
			pNOB	0.072	ISIT	>0.5
			PNI	0.190	ISIT	>0.63

Big Table for Spring Chinook Salmon. Management metrics and ranges of means for the most recent five years for hatchery- and natural-origin data that are available from ISIT, RMIS, Tacoma Power, and WDFW and FHMP adult goals.

*Suggested recovery target for Stabilizing population.

Recovery Targets								Source(s) of Current Data	FHMP Adult Goal	
Lower Cowlitz River		Upper Cowlitz River								
NA	1,800	1,800	1,000*	Hatchery		Natural				
Metrics				Min	Max	Min	Max			
Data to be Collected (Numbers)										
Mature Returns										
Totals	Total Survivors to Maturity			?		?			13,763	1,603
	Total Escapement to Cowlitz River			?		?			8,691	1,522
Harvest	Fishery Location	Ocean	Commercial Fishery	?		?				
			Tribal Fishery	?		?				
			Sport Fishery	?		?				
			Total Ocean	4,328		73		ISIT	4,328	73
		Columbia River	Commercial Fishery	?		?				
			Tribal Fishery	?		?				
			Sport Fishery	?		?				
			Total Columbia River	744		8		ISIT	744	8
		Lower Cowlitz River	Commercial Fishery	?		?				
			Tribal Fishery	?		?				
			Sport Fishery	5,728		8		ISIT		
			Total Lower Cowlitz River	5,728		8		ISIT	5,728	8
		Above Mayfield Dam	Cispus River	?		?				
			Upper Cowlitz River	701		2		ISIT		
			Tilton River	0		0		ISIT		
			Total Above Mayfield Dam	701		2		ISIT	701	2
	Fishery Type	Commercial		?		?				
		Tribal		?		?				
		Sport		?		?				
Total Harvest			11,501		91		ISIT	11,501	91	

Stray -ing	Stray Origin	Cowlitz River	Outside Cowlitz Basin	?		?		0	0
		Population	In Cowlitz Basin	?		?		0	0
		Other Population Strays in Cowlitz River		?		?		0	0
Trapping	Lower Cowlitz Subbasin Tributary Traps	Delameter Creek	Released Below Weir	?		?			0
			Released Above Weir	?		?			
			Kept for Broodstock	?		?			
			Mortalities	?		?		0	0
			Killed	?		?			0
			Total Caught	?		?			
		Lacamas Creek	Released Below Weir	?		?			0
			Released Above Weir	?		?			
			Kept for Broodstock	?		?			
			Mortalities	?		?		0	0
			Killed	?		?			0
			Total Caught	?		?			
		Olequa Creek	Released Below Weir	?		?			0
			Released Above Weir	?		?			
			Kept for Broodstock	?		?			
			Mortalities	?		?		0	0
			Killed	?		?			0
			Total Caught	?		?			
		Ostrander Creek	Released Below Weir	?		?			0
			Released Above Weir	?		?			
			Kept for Broodstock	?		?			
			Mortalities	?		?		0	0
			Killed	?		?			0
			Total Caught	?		?			
	Cowlitz Salmon Hatchery	Hatchery Broodstock Collected		1,624	1,825	0	0	ISIT, TPU, WDFW	1,100 275
		Released Below Dams		0	131	0	3	TPU, WDFW	0 0
		Released Above Dams	Upper Cowlitz Subbasin	4,750	8,918	208	239	ISIT, TPU, WDFW	1,320 1,155
			Tilton Subbasin	0	148	0	3	TPU, WDFW	0 0
		Mortalities		3	193	0	1	TPU, WDFW	<10% <10%
		Surplus (Food Bank, Outplant, Nutrient Enhancement)		658	709	0	0	TPU, WDFW	0 0
		Total		9,784	12,629	238	239	TPU, WDFW	2,689 1,589

Nature (pre-spawning)	Location	Below Dams	Lower Cowlitz River	Cowlitz River	562		98		ISIT	0	0	
				Out-of-Program Strays	?	?	?	?		0	0	
		Above Dams	Upper Cowlitz/Cispus Rivers			5,899		209		ISIT	1,100	1,100
			Tilton River			?		?			0	0
		Total				6,461		307		ISIT	1,100	1,100
Hatchery Production												
Spawners	Integrated Hatchery Program	Prespawn Mortalities			?	?	?	?		<25	<25	
		Killed, Not Spawned			?	?	?	?		0	0	
		Spawned			?	?	?	?		250	250	
	Segregated Hatchery Program	Prespawn Mortalities			180		NA		ISIT	<75	NA	
		Killed, Not Spawned			?	?	NA			0	NA	
		Spawned			1,645		NA		ISIT	750	NA	
	Total Hatchery	Prespawn Mortalities			180		0		ISIT	<25	<25	
		Killed, Not Spawned			?	?	?	?		0	0	
		Spawned			1,645	1,646	0	0	ISIT/WDFW	1,000	250	
Offspring - Rearing and Release	Integrated Hatchery Program	Green Eggs Collected (Fecundity)	Mean	?		?			2,292	2,292		
			Total	0		0		ISIT	573,024			
		Eyed Eggs (Eyed Fecundity)	Mean	?		?			2,084	2,084		
			Total	?		?			520,931			
			Released	?		?			0	0		
		Fry	Fry Produced	Number	?					496,125		
				Size	?					?		
			Fry Released	Number	?					0		
				Size	?					NA		
		Parr	Parr Produced	Number	?					472,500		
				Size	?					?		
			Parr Released	Number	?					0		
				Size	?					NA		
		Smolts	Smolts Produced	Number	0					450,000		
				Size	?					?		
			Smolts Released	Number	0					450,000		
				Size	?					?		
		Total Offspring Released			?					450,000		
		Marks and Tags	Type: CWT	Number	?					90,000		

Offspring - Rearing and Release	Segregated Hatchery Program			Green Eggs Collected (Fecundity)		Mean	3,863	NA	WDFW	4,584	NA		
						Total	3,148,899	NA	WDFW	1,719,073			
				Eyed Eggs (Eyed Fecundity)			Mean	?	NA		4,167	NA	
							Total	?	NA		1,562,794		
							Released	?	NA		0	NA	
				Fry	Fry Produced	Number	?	NA		1,488,375			
						Size	?	NA		?			
					Fry Released	Number	?	NA		0			
						Size	0	NA		?			
				Parr	Parr Produced	Number	?	NA		1,417,500			
						Size	?	NA		?			
					Parr Released	Number	?	NA		0			
						Size	51,888	NA	WDFW	?			
				Smolts	Smolts Produced	Number	?	NA		1,350,000			
						Size	?	NA		?			
					Smolts Released	Number	?	NA		1,350,000			
						Size	1,730,357	NA	WDFW	?			
	Total Offspring Released				1,782,246	NA	WDFW	1,350,000					
	Marks and Tags	Type: CWT	Number	259,485		NA	RMIS	0					
	Total Hatchery Programs			Green Eggs Collected (Fecundity)		Mean	3,863	NA	WDFW	3,667	3,667		
						Total	3,148,899	NA	WDFW	2,292,098			
				Eyed Eggs (Eyed Fecundity)			Mean	?	?	NA		3,334	3,334
							Total	?	?	NA		2,083,725	
							Released	?	?	NA		0	0
				Fry	Fry Produced	Number	?				1,984,500		
						Size	?				?		
					Fry Released	Number	0			WDFW	0		
						Size	?				?		
Parr				Parr Produced	Number	?				1,890,000			
					Size	?				?			
				Parr Released	Number	90,968-645,076			WDFW, RMIS	0			
					Size	?				?			
Smolts				Age-2 Smolts Produced	Number	?				1,800,000			
					Size	?				?			
				Age-2 Smolts Released	Number	1,303,849-1,881,888			WDFW, RMIS	1,800,000			
					Size	?				?			
Total Offspring Released				1,688,156-1,972,857			WDFW, RMIS	1,800,000					
Marks and Tags	Type: CWT	Number	259,485			RMIS	360,000						

Natural Production										
Below Dams	Lower Cowlitz River Mainstem	Spawners	Prespawn Mortalities in Nature	Lower Cowlitz River	?	?		0	0	
				Out-of-Program Strays	?	?		0	0	
			Spawners in Nature	Lower Cowlitz River	?	?		0	0	
				Out-of-Basin Strays	?	?		0	0	
		Offspring	Total Eggs Laid		?	?		0	0	
			Smolts Produced		?			NA	0	
			Smolts Trapped & Released	Number Trapped		?			NA	NA
				Number Released		?			NA	NA
				Type of Mark/Tag					NA	NA
				Number Marked/Tagged		?			NA	NA
	Lower Cowlitz River Tributaries	Spawners	Prespawn Mortalities in Nature	Lower Cowlitz River	?	?		0	0	
				Out-of-Program Strays	?	?		0	0	
			Spawners in Nature	Lower Cowlitz River	?	?		0	0	
				Out-of-Basin Strays	?	?		0	0	
		Offspring	Total Eggs Laid		?	?		0	0	
			Smolts Produced		?			0	0	
			Smolts Trapped & Released	Number Trapped		?			NA	NA
				Number Released		?			NA	NA
				Type of Mark/Tag					NA	NA
				Number Marked/Tagged		?			NA	NA
Above Dams	Cispus River	Spawners	Prespawn Mortalities in Nature	Cispus River	?	?		<50	<50	
				Out-of-Program Strays	?	?		0	0	
			Spawners in Nature	Cispus River	?	?		500	500	
				Out-of-Basin Strays	?	?		0	0	

Above Dams	Cispus River	Offspring	Total Eggs Laid		?	?		?	?		
			Smolts Produced			?		NA	42,857		
			Smolts Trapped & Released	Number Trapped			?		NA	30,000	
				Number Released			?		NA	30,000	
				Type of Mark/Tag			?		NA	NA	
				Number Marked/Tagged			?		NA	0	
				Upper Cowlitz River	Spawners	Prespawn Mortalities in Nature	Upper Cowlitz River	?	?		<50
	Out-of-Program Strays	?	?					0	0		
	Spawners in Nature	Upper Cowlitz River	?			?		500	500		
		Out-of-Program Strays	?			?		0	0		
	Offspring	Total Eggs Laid			?	?		?	?		
		Smolts Produced			123,558			CFFF (TPU/WDFW)	NA	42,857	
		Smolts Trapped & Released	Number Trapped		20,572			CFFF (TPU/WDFW)	NA	30,000	
			Number Released		?				NA	30,000	
			Type of Mark/Tag						NA	NA	
			Number Marked/Tagged		?				NA	0	
			Tilton River		Spawners	Prespawn Mortalities in Nature	Tilton River	?	?		0
	Out-of-Program Strays	?					?		0	0	
	Spawners in Nature	Tilton River				?	?		0	0	
		Out-of-Program Strays		?		?		0	0		
	Offspring	Total Eggs Laid		?	?		0	0			
		Smolts Produced		?				NA	0		
		Smolts Trapped & Released		Number Trapped		0				NA	0
				Number Released		?				NA	0
				Type of Mark/Tag						NA	NA
				Number Marked/Tagged		0				NA	0

Above Dams	Total	Spawners	Prespawn Mortalities in Nature	Tilton River	?	?		<257	<600		
				Out-of-Program Strays	?	?		0	0		
			Spawners in Nature	Tilton River	?	?		1,000	1,000		
				Out-of-Program Strays	?	?		0	0		
		Offspring	Total Eggs Laid			?	?		?	?	
			Smolts Produced			?			NA	85,714	
			Smolts Trapped & Released	Number Trapped			28,223		TPU Mayfield	NA	60,000
				Number Released			?			NA	60,000
				Type of Mark/Tag						NA	CWT
				Number Marked/Tagged			0		TPU, RMIS	NA	0
Smolt Migration											
Smolts	Location	Number of Smolts in Lower Cowlitz River	Lower Cowlitz River		?	?		1,800,000	0		
			Cispus River		?	?		0	30,000		
			Upper Cowlitz River		?	?		0	30,000		
			Tilton River		?	?		0	0		
			Total		?	?		1,800,000	60,000		
		Number of Smolts at Mouth of Cowlitz River	Lower Cowlitz River		?	?		?	?		
			Cispus River		?	?		?	?		
			Upper Cowlitz River		?	?		?	?		
			Tilton River		?	?		?	?		
			Total		?	?		?	?		
		Number of Smolts in Columbia River Estuary	Lower Cowlitz River		?	?		?	?		
			Cispus River		?	?		?	?		
			Upper Cowlitz River		?	?		?	?		
			Tilton River		?	?		?	?		
			Total		?	?		?	?		
		Management Metrics (Rates to be Calculated Using the Data Collected Above)									
Adult Salmon	Harvest Rate	Ocean	Commercial		?	?	?	?	?		
			Tribal		?	?	?	?	?		
			Sport		?	?	?	?	?		
			Total Ocean		20.7%	14.9%	ISIT	?	?		
		Columbia River	Commercial		?	?	?	?	?		
			Tribal		?	?	?	?	?		
			Sport		?	?	?	?	?		
			Total Columbia River		2.8%	1.6%	ISIT	?	?		

Adult Salmon	Harvest Rate	Cowlitz River	Lower Cowlitz River	Commercial	?	?	?	?		?	?
				Tribal	?	?	?	?		?	?
				Sport	26.9%		1.8%		ISIT	?	?
				Total Cowlitz River	26.9%		1.8%		ISIT	?	?
		Above Mayfield Dam - Sport		Upper Cowlitz Subbasin	2.7%		0.5%		ISIT	?	?
				Tilton Subbasin	0.0%		0.0%		ISIT	?	?
				Total Above Mayfield Dam	2.7%		18.9%		ISIT	?	?
		Total Harvest		Commercial	?	?	?	?		?	?
				Tribal	?	?	?	?		?	?
				Sport	?	?	?	?		?	?
				Total	53.1%		18.9%		ISIT	?	?
	Stray Rate	Cowlitz River Salmon		Out-of-Basin	?		?			<5%	<5%
				Cowlitz Basin	?		?			<5%	<5%
				Total	?		?			<5%	<5%
		Out-of-Basin Strays Into Cowlitz River			?		?			<5%	<5%
	Trapped at Barrier Dam	Lower Cowlitz River	Percentage of Cowlitz Salmon Hatchery Collection	Trapping Rate (% of Returns to Cowlitz River)	?	?	?	?		NA	NA
				Hatchery Broodstock	?	?	?	?		NA	NA
				Released Below Dams	?	?	?	?		NA	NA
				Released Above Dams	?	?	?	?		NA	NA
				Mortalities	?	?	?	?		NA	NA
				Surplus	?	?	?	?		NA	NA
		Tilton River	Percentage of Cowlitz Salmon Hatchery Collection	Trapping Rate (% of Returns to Cowlitz River)	?	?	?	?		NA	NA
				Hatchery Broodstock	?	?	?	?		NA	NA
				Released Below Dams	?	?	?	?		NA	NA
				Released Above Dams	?	?	?	?		NA	NA
				Mortalities	?	?	?	?		NA	NA
				Surplus	?	?	?	?		NA	NA

Adult Salmon	Trapped at Barrier Dam	Upper Cowlitz Subbasin	Percentage of Cowlitz Salmon Hatchery Collection	Trapping Rate (% of Returns to Cowlitz River)	43.2%	61.0%	ISIT, TPU, WDFW	?	?
				Hatchery Broodstock	24.1%	0.0%	ISIT, TPU, WDFW	?	?
				Released Below Dams	0.0%	0.0%	ISIT, TPU, WDFW	?	?
				Released Above Dams	70.1%	100.0%	ISIT, TPU, WDFW	?	?
				Mortalities	0.0%	0.0%	ISIT, TPU, WDFW	?	?
				Surplus	5.8%	0.0%	ISIT, TPU, WDFW	?	?
		Total	Percentage of Cowlitz Salmon Hatchery Collection	Trapping Rate (% of Returns to Cowlitz River)	43.2%	61.0%	ISIT, TPU, WDFW	?	?
				Hatchery Broodstock	24.1%	0.0%	ISIT, TPU, WDFW	?	?
				Released Below Dams	0.0%	0.0%	ISIT, TPU, WDFW	?	?
				To Tilton Subbasin	0.0%	0.0%	ISIT, TPU, WDFW	?	?
				To Upper Cowlitz Subbasin	70.1%	100.0%	ISIT, TPU, WDFW	?	?
				Mortalities	0.0%	0.0%	ISIT, TPU, WDFW	?	?
				Surplus	5.8%	0.0%	ISIT, TPU, WDFW	?	?
	Age (Run Year - Brood Year)	Integrated Hatchery Program	Age Composition (proportion)	Mean Age	?	NA		4.5	NA
				Age-2	?	NA		0%	NA
				Age-3	?	NA		5%	NA
				Age-4	?	NA		50%	NA
				Age-5	?	NA		35%	NA
				Age-6	?	NA		8%	NA
				Age-7	?	NA		2%	NA
		Segregated Hatchery Program	Age Composition (proportion)	Mean Age	?	NA		NA	NA
				Age-2	?	NA		NA	NA
				Age-3	?	NA		NA	NA
				Age-4	?	NA		NA	NA
				Age-5	?	NA		NA	NA
				Age-6	?	NA		NA	NA
				Age-7	?	NA		NA	NA

Adult Salmon	Age (Run Year - Brood Year)			Mean Age	3.27	NA	RMIS	4.5	NA
		Total Hatchery	Age Composition (proportion)	Age-2	0.000	NA	RMIS	0%	NA
				Age-3	0.201	NA	RMIS	5%	NA
				Age-4	0.381	NA	RMIS	50%	NA
				Age-5	0.363	NA	RMIS	35%	NA
				Age-6	0.055	NA	RMIS	8%	NA
				Age-7	0.000	NA	RMIS	2%	NA
		Lower Cowlitz Subbasin Natural-origin	Age Composition (proportion)	Mean Age	NA	?		NA	NA
				Age-2	NA	?		NA	NA
				Age-3	NA	?		NA	NA
				Age-4	NA	?		NA	NA
				Age-5	NA	?		NA	NA
				Age-6	NA	?		NA	NA
				Age-7	NA	?		NA	NA
		Upper Cowlitz Subbasin Natural-origin	Age Composition (proportion)	Mean Age	NA	?		NA	4.5
				Age-2	NA	?		NA	0%
				Age-3	NA	?		NA	5%
				Age-4	NA	?		NA	50%
				Age-5	NA	?		NA	35%
				Age-6	NA	?		NA	8%
				Age-7	NA	?		NA	2%
		Tilton Subbasin Natural-origin	Age Composition (proportion)	Mean Age	NA	?		NA	NA
				Age-2	NA	?		NA	NA
				Age-3	NA	?		NA	NA
				Age-4	NA	?		NA	NA
				Age-5	NA	?		NA	NA
				Age-6	NA	?		NA	NA
				Age-7	NA	?		NA	NA
		Total Natural-origin	Age Composition (proportion)	Mean Age	NA	?		NA	4.5
				Age-2	NA	?		NA	0%
				Age-3	NA	?		NA	5%
				Age-4	NA	?		NA	50%
				Age-5	NA	?		NA	35%
				Age-6	NA	?		NA	8%
Age-7	NA			?		NA	2%		

Spawning	In Hatchery	Integrated Hatchery Program	Prespawn Mortality Rate	NA	NA		<5%	<5%
			Mean Fecundity	NA	NA		4,500	4,500
			Mean Eyed Fecundity	NA	NA		4,275	4,275
			Fertility	NA	NA		95%	95%
		Segregated Hatchery Program	Prespawn Mortality Rate	9.8%	NA	ISIT	NA	NA
			Mean Fecundity	3,863	NA		NA	NA
			Mean Eyed Fecundity	?	NA		NA	NA
			Fertility	?	NA		NA	NA
		Total Hatchery	Prespawn Mortality Rate	9.8%		ISIT	<5%	<5%
			Mean Fecundity	3,863	NA	WDFW	4,500	4,500
			Mean Eyed Fecundity	?	NA		4,275	4,275
			Fertility	?	NA		95%	95%
	In Nature	Lower Cowlitz River	Prespawn Mortality Rate	?	?		NA	NA
			Mean Fecundity	?	?		NA	NA
		Cispus River	Prespawn Mortality Rate	?	?		<5%	<5%
			Mean Fecundity	?	?		4,500	4,500
		Upper Cowlitz River / Subbasin	Prespawn Mortality Rate	?	?		<5%	<5%
			Mean Fecundity	?	?		4,500	4,500
		Tilton River	Prespawn Mortality Rate	?	?		NA	NA
			Mean Fecundity	?	?		NA	NA
Survival of Offspring to Smolt Stage	In Hatchery	Integrated Hatchery Program	Fertility Rate	?	?		95%	NA
			Eyed Egg-to-Fry Survival	?	NA		95%	NA
			Fry-to-Parr Survival	?	NA		95%	NA
			Parr-to-Smolt Survival	?	NA		95%	NA
			Green Egg-to-Smolt Survival	?	NA		81%	NA
		Segregated Hatchery Program	Fertility Rate	?	?		95%	NA
			Eyed Egg-to-Fry Survival	?	NA		95%	NA
			Fry-to-Parr Survival	?	NA		95%	NA
			Parr-to-Smolt Survival	?	NA		95%	NA
			Green Egg-to-Smolt Survival	?	NA		81%	NA
		Total Hatchery	Fertility Rate	?	?		95%	NA
			Eyed Egg-to-Fry Survival	?	NA		95%	NA
			Fry-to-Parr Survival	?	NA		95%	NA
			Parr-to-Smolt Survival	?	NA		95%	NA
			Green Egg-to-Smolt Survival	60.5% - 75.7%		ISIT, WDFW	81%	NA

Survival of Offspring to Smolt Stage	In Nature	Lower Cowlitz River	Green Egg-to-Smolt Survival	NA	?		NA	?
		Cispus River	Green Egg-to-Smolt Survival	NA	?		NA	?
		Upper Cowlitz River / Subbasin	Green Egg-to-Smolt Survival	NA	?		NA	?
		Tilton River	Green Egg-to-Smolt Survival	NA	?		NA	?
	Marking / Tagging Rate	Hatchery-origin	Integrated Hatchery Program	?	NA		?	NA
			Segregated Hatchery Program	14.7% 14.9%	NA	RMIS/WDFW	?	NA
			Total Hatchery	14.7% 14.9%	NA	RMIS/WDFW	?	NA
		Natural-origin	Lower Cowlitz River	NA	?		?	NA
			Cispus River	NA	?		?	NA
			Upper Cowlitz River / Subbasin	NA	?		?	NA
			Tilton River	NA	?		?	NA
Survival to Maturity	Integrated Hatchery Program	Smolt Survival	to Mouth of Cowlitz River	?	NA		?	NA
			to Columbia River Estuary	?	NA		?	NA
		Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?	NA		?	NA
			Parr	?	NA		?	NA
			Smolts	?	NA		0.07%	NA
		Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?	NA		?	NA
			Parr	?	NA		?	NA
			Smolts	?	NA		0.39%	NA
		Productivity (Recruits / Spawner)	Smolts / Female Spawner	?	NA		450	NA
			Smolts / Adult+Jack Spawner	?	NA		900	NA
			Female-to-Female	?	NA		>>1	NA
			Adult-to-Adult	?	NA		>>1	NA
			Adult+Jack-to-Adult+Jack	?	NA		>>1	NA
			Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA		>>1	NA

Survival to Maturity

Segregated Hatchery Program	Smolt Survival	to Mouth of Cowlitz River	?	NA		?	NA
		to Columbia River Estuary	?	NA		?	NA
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?	NA		?	NA
		Parr	0.075%	NA	RMIS	?	NA
		Smolts	0.677%	NA	RMIS	0.07%	NA
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?	NA		?	NA
		Parr	0.124%	NA	RMIS	?	NA
		Smolts	1.201%	NA	RMIS	0.39%	NA
	Productivity (Recruits / Spawner)	Smolts / Female Spawner	?	NA		450	NA
		Smolts / Adult+Jack Spawner	?	NA		900	NA
		Female-to-Female	?	NA		>>1	NA
		Adult-to-Adult	0.766	NA	ISIT, WDFW	>>1	NA
Adult+Jack-to-Adult+Jack		?	NA		>>1	NA	
Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack		?	NA		>>1	NA	

Total Hatchery	Smolt Survival	to Mouth of Cowlitz River	?	NA		?	NA
		to Columbia River Estuary	?	NA		?	NA
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?	NA		?	NA
		Parr	0.08%	NA	RMIS	?	NA
		Smolts	0.677%	NA	RMIS	0.07%	NA
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?	NA		?	NA
		Parr	0.124%	NA	RMIS	?	NA
		Smolts	1.201%	NA	RMIS	0.39%	NA
	Productivity (Recruits / Spawner)	Smolts / Female Spawner	2,334	NA	ISIT, WDFW	450	NA
		Smolts / Adult+Jack Spawner	1,163	NA	ISIT, WDFW	900	NA
		Female-to-Female	?	NA		>>1	NA
		Adult-to-Adult	0.766	NA	ISIT, WDFW	>>1	NA
Adult+Jack-to-Adult+Jack		?	NA		>>1	NA	
Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack		?	NA		>>1	NA	

Survival to Maturity

Lower Cowlitz River Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	NA		NA	NA
	Smolt Passage (Transport) Survival	NA	NA		NA	NA
	Smolt Survival to Mouth of Cowlitz River	NA	?		NA	NA
	Smolt Survival to Columbia River Estuary	NA	?		NA	NA
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	NA
	Parr	NA	?		NA	NA
	Smolts	NA	?		NA	NA
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	NA
	Parr	NA	?		NA	NA
	Smolts	NA	?		NA	NA
	Smolts / Female Spawner	?	NA		NA	NA
	Smolts / Adult+Jack Spawner	?	NA		NA	NA
	Productivity (Recruits / Spawner) Female-to-Female	?	NA		NA	NA
	Adult-to-Adult	?	NA		NA	NA
	Adult+Jack-to-Adult+Jack	?	NA		NA	NA
	Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA		NA	NA
Cispus River Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	?		NA	>75%
	Smolt Passage (Transport) Survival	NA	?		NA	>99%
	Smolt Survival to Mouth of Cowlitz River	NA	?		NA	?
	Smolt Survival to Columbia River Estuary	NA	?		NA	?
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	?
	Parr	NA	?		NA	?
	Smolts	NA	?		NA	?
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	?
	Parr	NA	?		NA	?
	Smolts	NA	?		NA	?
	Smolts / Female Spawner	?	NA		NA	?
	Smolts / Adult+Jack Spawner	?	NA		NA	?
	Productivity (Recruits / Spawner) Female-to-Female	?	NA		NA	>1
	Adult-to-Adult	?	NA		NA	>1
	Adult+Jack-to-Adult+Jack	?	NA		NA	>1
	Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA		NA	>1

Survival to Maturity	Upper Cowlitz River/ Subbasin Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	25.9%	CFFF (TPU/WDFW)	NA	>75%
		Smolt Passage (Transport) Survival	NA	?		NA	>99%
		Smolt Survival to Mouth of Cowlitz River	NA	?		NA	?
		Smolt Survival to Columbia River Estuary	NA	?		NA	?
		Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	?
		Parr	NA	?		NA	?
		Smolts	NA	?		NA	?
		Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	?
		Parr	NA	?		NA	?
		Smolts	NA	?		NA	?
		Smolts / Female Spawner	?	NA		NA	?
		Smolts / Adult+Jack Spawner	?	NA		NA	?
		Productivity (Recruits / Spawner) Female-to-Female	?	NA		NA	>1
		Adult-to-Adult	?	NA		NA	>1
		Adult+Jack-to-Adult+Jack	?	NA		NA	>1
		Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA		NA	>1
	Tilton River Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	?		NA	NA
		Smolt Passage (Transport) Survival	NA	?		NA	NA
		Smolt Survival to Mouth of Cowlitz River	NA	?		NA	NA
		Smolt Survival to Columbia River Estuary	NA	?		NA	NA
		Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	NA
		Parr	NA	?		NA	NA
		Smolts	NA	?		NA	NA
		Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	NA
		Parr	NA	?		NA	NA
		Smolts	NA	?		NA	NA
		Smolts / Female Spawner	NA	?		NA	NA
		Smolts / Adult+Jack Spawner	NA	?		NA	NA
		Productivity (Recruits / Spawner) Female-to-Female	NA	?		NA	NA
		Adult-to-Adult	NA	?		NA	NA
		Adult+Jack-to-Adult+Jack	NA	?		NA	NA
		Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	NA	?		NA	NA

Proportional Natural Influence	Lower Cowlitz River	Collected/ Released	pHOS	0.874	ISIT	NA
			pNOB	NA		NA
			PNI	NA		NA
		Actual Spawners	pHOS	NA		NA
			pNOB	NA		NA
			PNI	NA		NA
	Cispus River	Collected/ Released	pHOS	?		<0.35
			pNOB	?		>0.6
			PNI	?		>0.63
		Actual Spawners	pHOS	?		<0.3
			pNOB	?		>0.6
			PNI	?		>0.67
	Upper Cowlitz River/Subbasin	Collected/ Released	pHOS	0.938	ISIT	<0.35
			pNOB	0.000	ISIT	>0.6
			PNI	0.000	ISIT	>0.63
		Actual Spawners	pHOS	?		<0.3
			pNOB	?		>0.6
			PNI	?		>0.67
	Tilton River	Collected/ Released	pHOS	NA		NA
			pNOB	NA		NA
			PNI	NA		NA
		Actual Spawners	pHOS	NA		NA
			pNOB	NA		NA
			PNI	NA		NA
	Total	Collected/ Released	pHOS	0.935	ISIT, TPU, WDFW	<0.35
			pNOB	0.000	ISIT, TPU, WDFW	>0.6
			PNI	0.000	ISIT, TPU, WDFW	>0.63
		Actual Spawners	pHOS	?		<0.3
			pNOB	?		>0.6
			PNI	?		>0.67

Big Table for Coho Salmon. Management metrics and ranges of means for the most recent five years for hatchery- and natural-origin data that are available from ISIT, RMIS, Tacoma Power, and WDFW and FHMP adult goals. *Suggested recovery target for Stabilizing population.

Recovery Targets								Source(s) of Current Data	FHMP Adult Goal	
Lower Cowlitz		Upper Cowlitz								
River	Cispus River	River	Tilton River	Last 5 Years Adult Mean						
3,700	2,000	2,000	2,000*	Hatchery		Natural				
Metrics				Min	Max	Min	Max			
Data to be Collected (Numbers)										
Mature Returns										
Totals	Total Survivors to Maturity			?		?			73,029	20,798
	Total Escapement to Cowlitz River			?		?			12,751	14,868
Harvest	Fishery Location	Ocean	Commercial Fishery	?		?				
			Tribal Fishery	?		?				
			Sport Fishery	?		?				
			Total Ocean	38,857		2,185		ISIT	38,800	2,089
		Columbia River	Commercial Fishery	?		?				
			Tribal Fishery	?		?				
			Sport Fishery	?		?				
			Total Columbia River	19,835		1,691		ISIT	19,804	1,617
		Lower Cowlitz River	Commercial Fishery	?		?				
			Tribal Fishery	?		?				
			Sport Fishery	6,714		887		ISIT		
			Total Lower Cowlitz River	6,714		887		ISIT	6,714	887
		Above Mayfield Dam	Cispus River	?		?				
			Upper Cowlitz River	1,583		37		ISIT		
			Tilton River	1,150		80		ISIT		
			Total Above Mayfield Dam	2,733		117		ISIT	2,733	117
	Fishery Type	Commercial		?		?				
		Tribal		?		?				
		Sport		?		?				
	Total Harvest			68,139		4,880		ISIT	68,051	4,710
Population	Cowlitz River	Outside Cowlitz Basin	?		?			0	0	
		In Cowlitz Basin	?		?			0	0	

Trapping	Other Population Strays in Cowlitz River			?		?			0	0
	Lower Cowlitz Subbasin Tributary Traps	Delameter Creek	Released Below Weir	?		?				0
			Released Above Weir	?		?				
			Kept for Broodstock	?		?				
			Mortalities	?		?			0	0
			Killed	?		?				0
			Total Caught	?		?				
		Lacamas Creek	Released Below Weir	?		?				0
			Released Above Weir	?		?				
			Kept for Broodstock	?		?				
			Mortalities	?		?			0	0
			Killed	?		?				0
			Total Caught	?		?				
		Olequa Creek	Released Below Weir	?		?				0
			Released Above Weir	?		?				
			Kept for Broodstock	?		?				
			Mortalities	?		?			0	0
			Killed	?		?				0
			Total Caught	?		?				
		Ostrander Creek	Released Below Weir	?		?				0
			Released Above Weir	?		?				
			Kept for Broodstock	?		?				
			Mortalities	?		?			0	0
			Killed	?		?				0
			Total Caught	?		?				
	Cowlitz Salmon Hatchery	Hatchery Broodstock Collected		1,582	2,305	619	1,696	ISIT, TPU	629	943
		Released Below Dams		59	128	0	0	TPU, WDFW	0	0
		Released Above Dams	Upper Cowlitz Subbasin	2,699	10,009	2,243	10,445	ISIT, TPU, WDFW	2,811	5,154
			Tilton Subbasin	4,237	5,088	4,187	4,912	ISIT, TPU, WDFW	1,104	2,577
		Mortalities		2	152	0	62	TPU, WDFW	<10%	<10%
		Surplus (Food Bank, Outplant, Nutrient Enhancement, etc)		13,617	14,660	0	0	TPU, WDFW	5,000	0
		Total		21,380		4,806		TPU, WDFW	4,570	7,077
(pre-spawning)	Location	Below Dams	Lower Cowlitz River	?		?			1,762	4,111
				?	?	?	?		0	0
		Above Dams	Upper Cowlitz/Cispus Rivers	8,771		2,315		ISIT	1,905	4,444
			Tilton River	3,318		3,605		ISIT	952	2,222

Total				12,089		5,920		ISIT	4,619	10,778	
Hatchery Production											
Spawners	Integrated Hatchery Program	Prespawn Mortalities		23		53		ISIT	<92	<113	
		Killed, Not Spawned		?		?			0	0	
		Spawned		274		556		ISIT	1,753	2,142	
	Segregated Hatchery Program	Prespawn Mortalities		158		NA		ISIT	0	0	
		Killed, Not Spawned		?		NA			0	0	
		Spawned		1,241		NA		ISIT	750	0	
	Total Hatchery	Prespawn Mortalities		152	181	53	62	ISIT, WDFW	<92	<113	
		Killed, Not Spawned		?	?	?	?		0	0	
		Spawned		403	556	1,900	2,070	ISIT, WDFW	1,753	2,142	
Offspring - Rearing and Release	Integrated Hatchery Program	Green Eggs Collected (Fecundity)	Mean	3,561		3,513		ISIT	3,564	3,564	
			Total	516,230		942,844		ISIT	2,801,453		
		Eyed Eggs (Eyed Fecundity)	Mean	?	?	?	?		3,240	3,240	
			Total	?	?	?	?		2,546,775		
			Released	?	?	?	?		0	0	
		Fry	Fry Produced	Number	?	?	?	?	2,425,500		
				Size	?	?	NA	NA	?		
			Fry Released	Number	?	?	NA	NA	0		
				Size	?	?	NA	NA	NA		
		Parr	Parr Produced	Number	?	?	NA	NA	2,310,000		
				Size	?	?	NA	NA	?		
			Parr Released	Number	?	?	NA	NA	0		
				Size	?	?	NA	NA	NA		
		Smolts	Smolts Produced	Number	958,815				ISIT	2,200,000	
				Size	?	?	NA	NA	?		
			Smolts Released	Number	958,815				ISIT	2,200,000	
				Size	?					?	
		Total Offspring Released			958,815				ISIT	CWT	
	Marks and Tags	Type: CWT	Number	?					440,000		

Offspring - Rearing and Release	Segregated Hatchery Program			Green Eggs Collected (Fecundity)		Mean		3,513		NA		ISIT		0		NA					
				Total		2,176,135		NA		ISIT		0									
				Eyed Eggs (Eyed Fecundity)			Mean		?		?		NA				0		NA		
							Total		?		?		NA				0				
							Released		?		?		NA				0		NA		
				Fry		Fry Produced		Number		?		?		NA				0			
								Size		?		?		NA				?			
						Fry Released		Number		?		?		NA				0			
								Size		?		?		NA				?			
				Parr		Parr Produced		Number		?		?		NA				0			
								Size		?		?		NA				?			
						Parr Released		Number		?		?		NA				0			
								Size		?		?		NA				?			
				Smolts		Smolts Produced		Number		1,234,982				NA		ISIT		0			
								Size		?		?		NA				?			
						Smolts Released		Number		1,234,982				NA		ISIT		0			
								Size		?		?		NA				?			
				Total Offspring Released						1,234,982				NA		ISIT		NA			
				Marks and Tags		Type: CWT	Number			?				NA				0			
				Total Hatchery Programs			Green Eggs Collected (Fecundity)		Mean		1,377		2,956		1,377		2,956		ISIT, WDFW		3,564
Total		2,393,300							2,692,365		753,352		942,844		ISIT, WDFW		2,801,453				
Eyed Eggs (Eyed Fecundity)			Mean				?		?		?				3,240		3,240				
			Total				?		?		?				2,546,775						
			Released				?		?		?				0		0				
Fry		Fry Produced					Number		?		?		NA				2,425,500				
							Size		?		?		NA				?				
		Fry Released					Number		35,128		300,568		NA		WDFW		0				
							Size		?		?		NA				?				
Parr		Parr Produced					Number		?		?		NA				2,310,000				
							Size		?		?		NA				?				
		Parr Released					Number		62,717		131,184		NA		WDFW		0				
							Size		?		?		NA				?				
Smolts		Age-2 Smolts Produced					Number		?		?		NA				2,200,000				
							Size		?		?		NA				?				
		Age-2 Smolts Released					Number		2,193,797		2,503,284		NA		ISIT, WDFW, RMIS		2,200,000				
							Size		?		?		NA				?				
Total Offspring Released						2,291,642		2,935,036		NA				2,200,000							
Marks and Tags		Type: CWT	Number			?				NA				440,000							

Natural Production													
Below Dams	Lower Cowlitz River Mainstem	Spawners	Prespawn Mortalities in Nature	Lower Cowlitz River	?	?	?	?		<159	<370		
				Out-of-Program Strays	?	?	?	?		0	0		
			Spawners in Nature	Lower Cowlitz River	508		4,727		ISIT	1,586	3,700		
				Out-of-Basin Strays	?	?	?	?		0	0		
		Offspring	Total Eggs Laid			?	?	?	?		?	?	
			Smolts Produced			?					NA	158,665	
			Smolts Trapped & Released	Number Trapped			NA					NA	NA
				Number Released			NA					NA	NA
				Type of Mark/Tag			NA					NA	NA
				Number Marked/Tagged			NA					NA	NA
		Lower Cowlitz River Tributaries	Spawners	Prespawn Mortalities in Nature	Lower Cowlitz River	?	?	?	?		0	0	
					Out-of-Program Strays	?	?	?	?		0	0	
				Spawners in Nature	Lower Cowlitz River	?	?	?	?		0	0	
					Out-of-Basin Strays	?	?	?	?		0	0	
	Offspring		Total Eggs Laid			?	?	?	?		0	0	
			Smolts Produced			?					0	0	
			Smolts Trapped & Released	Number Trapped			NA					NA	NA
				Number Released			NA					NA	NA
				Type of Mark/Tag			NA					NA	NA
				Number Marked/Tagged			NA					NA	NA
Above Dams	Cispus River	Spawners	Prespawn Mortalities in Nature	Cispus River	?		?			<86	<200		
			Out-of-Program Strays	?	?			0	0				
			Spawners in Nature	Cispus River	?		?			857	2,000		
			Out-of-Basin Strays	?	?			0	0				

Above Dams	Cispus River	Offspring	Total Eggs Laid		?	?		?	?
			Smolts Produced		?			NA	64,286
			Smolts Trapped & Released	Number Trapped	?			NA	45,000
				Number Released	?	?		NA	45,000
				Type of Mark/Tag	?	?		NA	NA
				Number Marked/Tagged	?	?		NA	0
	Upper Cowlitz River	Spawners	Prespawn Mortalities in Nature	Upper Cowlitz River	?	?		<86	<200
				Out-of-Program Strays	?	?		0	0
			Spawners in Nature	Upper Cowlitz River	?	?		857	2,000
				Out-of-Program Strays	?	?		0	0
		Offspring	Total Eggs Laid		?	?		?	?
			Smolts Produced		145,455		CFFF (TPU/WDFW)	NA	64,286
			Smolts Trapped & Released	Number Trapped	118,138		CFFF (TPU/WDFW)	NA	45,000
				Number Released	?			NA	45,000
				Type of Mark/Tag	NA			NA	NA
				Number Marked/Tagged	96,493		RMIS	NA	0
	Tilton River	Spawners	Prespawn Mortalities in Nature	Tilton River	?	?		<86	<200
				Out-of-Program Strays	?	?		0	0
			Spawners in Nature	Tilton River	?	?		857	2,000
				Out-of-Program Strays	?	?		0	0
		Offspring	Total Eggs Laid		?	?		?	?
			Smolts Produced		?			NA	64,286
			Smolts Trapped & Released	Number Trapped	28,631		TPU Mayfield	NA	45,000
				Number Released	?			NA	45,000
				Type of Mark/Tag	NA			NA	CWT
				Number Marked/Tagged	25,774		TPU, RMIS	NA	45,000

Above Dams	Total	Spawners	Prespawn	Tilton River	?		?		<257	<600			
			Mortalities in Nature	Out-of-Program Strays	?		?		0	0			
		Spawners in Nature	Tilton River	?		?		2,571	6,000				
			Out-of-Program Strays	?		?		0	0				
		Offspring	Total Eggs Laid		?		?		?	?			
			Smolts Produced		?					NA	192,857		
			Smolts Trapped & Released	Number Trapped		28,223			TPU Mayfield	NA	135,000		
				Number Released		?				NA	135,000		
				Type of Mark/Tag		NA				NA	CWT		
				Number Marked/Tagged		122,267			TPU, RMIS	NA	>45,000		
Smolt Migration													
Smolts	Location	Number of Smolts in Lower Cowlitz River	Lower Cowlitz River		2,193,797	2,279,449	?		ISIT, WDFW, RMIS	2,200,000	158,665		
			Cispus River		?		?			0	45,000		
			Upper Cowlitz River		?		?			0	0		
			Tilton River		?		?			0	45,000		
			Total		?		?			2,200,000	293,665		
		Number of Smolts at Mouth of Cowlitz River	Lower Cowlitz River		?		?			?	?		
			Cispus River		?		?			?	?		
			Upper Cowlitz River		?		?			?	?		
			Tilton River		?		?			?	?		
			Total		?		?			?	?		
		Number of Smolts in Columbia River Estuary	Lower Cowlitz River		?		?			?	?		
			Cispus River		?		?			?	?		
			Upper Cowlitz River		?		?			?	?		
			Tilton River		?		?			?	?		
			Total		?		?			?	?		
		Management Metrics (Rates to be Calculated Using the Data Collected Above)											
		Adult Salmon	Harvest Rate	Ocean	Commercial		?	?	?	?		?	?
					Tribal		?	?	?	?		?	?
Sport					?	?	?	?		?	?		
Total Ocean					44.9%	47.6%	12.0%	14.0%	ISIT, TPU	?	?		
Columbia River	Commercial			?	?	?	?		?	?			
	Tribal			?	?	?	?		?	?			
	Sport			?	?	?	?		?	?			
	Total Columbia River			19.2%	20.5%	6.8%	8.0%	ISIT, TPU	?	?			

Adult Salmon	Harvest Rate		Lower Cowlitz River	Commercial	?	?	?	?		?	?		
				Tribal	?	?	?	?		?	?		
				Sport	6.3%	24.6%	1.6%	5.5%	ISIT, TPU	?	?		
				Total Cowlitz River	6.3%	24.6%	1.6%	5.5%	ISIT, TPU	?	?		
			Cowlitz River	Above Mayfield Dam - Sport	Upper Cowlitz Subbasin	1.8%	13.3%	0.2%	1.9%	ISIT, TPU	?	?	
					Tilton Subbasin	1.7%	24.5%	0.7%	1.9%	ISIT, TPU	?	?	
					Total Above Mayfield Dam	3.4%		1.0%		ISIT	?	?	
			Total Harvest	Commercial	?	?	?	?		?	?		
				Tribal	?	?	?	?		?	?		
				Sport	?	?	?	?		?	?		
				Total	?		?			?	?		
			Stray Rate		Cowlitz River Salmon	Out-of-Basin	?		?			<5%	<5%
						Cowlitz Basin	?		?			<5%	<5%
	Total	?				?			<5%	<5%			
	Out-of-Basin Strays Into Cowlitz River	?			?			<5%	<5%				
	Trapped at Barrier Dam		Lower Cowlitz River	Trapping Rate (% of Returns to Cowlitz River)	?	?	NA			NA	NA		
				Percentage of Cowlitz Salmon Hatchery Collection	Hatchery Broodstock	?	?	NA			NA	NA	
					Released Below Dams	?	?	NA			NA	NA	
					Released Above Dams	?	?	NA			NA	NA	
					Mortalities	?	?	NA			NA	NA	
					Surplus	?	?	NA			NA	NA	
					Tilton River	Trapping Rate (% of Returns to Cowlitz River)	?	?	?	?		NA	NA
			Percentage of Cowlitz Salmon Hatchery Collection	Hatchery Broodstock		?	?	?	?		NA	NA	
				Released Below Dams		?	?	?	?		NA	NA	
				Released Above Dams		?	?	?	?		NA	NA	
				Mortalities		?	?	?	?		NA	NA	
Surplus				?		?	?	?		NA	NA		

Adult Salmon	Trapped at Barrier Dam	Upper Cowlitz Subbasin	Percentage of Cowlitz Salmon Hatchery Collection	Trapping Rate (% of Returns to Cowlitz River)	?		?			?	?
				Hatchery Broodstock	?		?			?	?
				Released Below Dams	?		?			?	?
				Released Above Dams	?		?			?	?
				Mortalities	?		?			?	?
				Surplus	?		?			?	?
		Total	Percentage of Cowlitz Salmon Hatchery Collection	Trapping Rate (% of Returns to Cowlitz River)	21.1%	25.4%	36.3%	61.7%	ISIT, TPU, WDFW	?	?
				Hatchery Broodstock	16.0%	19.1%	10.9%	15.1%	ISIT, TPU, WDFW	?	?
				Released Below Dams	0.4%	0.5%	0.0%	0.0%	ISIT, TPU, WDFW	?	?
				To Tilton Subbasin	35.0%	53.3%	21.8%	41.7%	ISIT, TPU, WDFW	?	?
				To Upper Cowlitz Subbasin	29.6%	39.5%	63.4%	84.9%	ISIT, TPU, WDFW	?	?
				Mortalities	0.0%	1.3%	0.0%	1.4%	ISIT, TPU, WDFW	?	?
				Surplus	30.2%	43.9%	0.0%	0.1%	ISIT, TPU, WDFW	?	?
	Age (Run Year - Brood Year)	Integrated Hatchery Program	Age Composition (proportion)	Mean Age	?		NA			3.9	NA
				Age-2	?		NA			0%	NA
				Age-3	?		NA			10%	NA
				Age-4	?		NA			90%	NA
				Age-5	?		NA			0%	NA
				Age-6	?		NA			0%	NA
				Age-7	?		NA			0%	NA
		Segregated Hatchery Program	Age Composition (proportion)	Mean Age	?		NA			NA	NA
				Age-2	?		NA			NA	NA
				Age-3	?		NA			NA	NA
				Age-4	?		NA			NA	NA
				Age-5	?		NA			NA	NA
				Age-6	?		NA			NA	NA
				Age-7	?		NA			NA	NA

Adult Salmon	Age (Run Year - Brood Year)			Mean Age	2.92	NA	RMIS	3.9	NA
		Total Hatchery	Age Composition (proportion)	Age-2	0.000	NA	RMIS	0%	NA
				Age-3	0.085	NA	RMIS	10%	NA
				Age-4	0.915	NA	RMIS	90%	NA
				Age-5	0.001	NA	RMIS	0%	NA
				Age-6	0.000	NA	RMIS	0%	NA
				Age-7	0.000	NA	RMIS	0%	NA
						Mean Age	NA	?	
		Lower Cowlitz Subbasin Natural-origin	Age Composition (proportion)	Age-2	NA	?		NA	0%
				Age-3	NA	?		NA	10%
				Age-4	NA	?		NA	90%
				Age-5	NA	?		NA	0%
				Age-6	NA	?		NA	0%
				Age-7	NA	?		NA	0%
						Mean Age	NA	?	
		Upper Cowlitz Subbasin Natural-origin	Age Composition (proportion)	Age-2	NA	?		NA	0%
				Age-3	NA	?		NA	10%
				Age-4	NA	?		NA	90%
				Age-5	NA	?		NA	0%
				Age-6	NA	?		NA	0%
				Age-7	NA	?		NA	0%
						Mean Age	NA	?	
		Tilton Subbasin Natural-origin	Age Composition (proportion)	Age-2	NA	?		NA	0%
				Age-3	NA	?		NA	10%
				Age-4	NA	?		NA	90%
				Age-5	NA	?		NA	0%
				Age-6	NA	?		NA	0%
				Age-7	NA	?		NA	0%
						Mean Age	NA	?	
		Total Natural-origin	Age Composition (proportion)	Age-2	NA	?		NA	0%
				Age-3	NA	?		NA	10%
				Age-4	NA	?		NA	90%
				Age-5	NA	?		NA	0%
				Age-6	NA	?		NA	0%
				Age-7	NA	?		NA	0%

Spawning	In Hatchery	Integrated Hatchery Program	Prespawn Mortality Rate	8.9%		ISIT	<5%	<5%
			Mean Fecundity	?	?		3,000	3,000
			Mean Eyed Fecundity	?	?		2,850	2,850
			Fertility	?	?		95%	95%
		Segregated Hatchery Program	Prespawn Mortality Rate	12.7%	NA	ISIT	NA	NA
			Mean Fecundity	?	NA		NA	NA
			Mean Eyed Fecundity	?	NA		NA	NA
			Fertility	?	NA		NA	NA
		Total Hatchery	Prespawn Mortality Rate	10.8%		ISIT	<5%	<5%
			Mean Fecundity	3,562	6,147	WDFW	3,000	3,000
			Mean Eyed Fecundity	?	?		2,850	2,850
			Fertility	?	?		95%	95%
	In Nature	Lower Cowlitz River	Prespawn Mortality Rate	?	?		<5%	<5%
			Mean Fecundity	?	?		3,000	3,000
		Cispus River	Prespawn Mortality Rate	?	?		<5%	<5%
			Mean Fecundity	?	?		3,000	3,000
		Upper Cowlitz River / Subbasin	Prespawn Mortality Rate	?	?		<5%	<5%
			Mean Fecundity	?	?		3,000	3,000
		Tilton River	Prespawn Mortality Rate	?	?		<5%	<5%
			Mean Fecundity	?	?		3,000	3,000
Survival of Offspring to Smolt Stage	In Hatchery	Integrated Hatchery Program	Fertility Rate	?	?		95%	NA
			Eyed Egg-to-Fry Survival	?	NA		95%	NA
			Fry-to-Parr Survival	?	NA		95%	NA
			Parr-to-Smolt Survival	?	NA		95%	NA
			Green Egg-to-Smolt Survival	?	NA		81%	NA
		Segregated Hatchery Program	Fertility Rate	?	?		95%	NA
			Eyed Egg-to-Fry Survival	?	NA		95%	NA
			Fry-to-Parr Survival	?	NA		95%	NA
			Parr-to-Smolt Survival	?	NA		95%	NA
			Green Egg-to-Smolt Survival	?	NA		81%	NA
		Total Hatchery	Fertility Rate	?	?		95%	NA
			Eyed Egg-to-Fry Survival	?	NA		95%	NA
			Fry-to-Parr Survival	?	NA		95%	NA
			Parr-to-Smolt Survival	?	NA		95%	NA
			Green Egg-to-Smolt Survival	72.7%		WDFW	81%	NA

Survival of Offspring to Smolt Stage	In Nature	Lower Cowlitz River	Green Egg-to-Smolt Survival	NA	?		NA	?
		Cispus River	Green Egg-to-Smolt Survival	NA	?		NA	?
		Upper Cowlitz River / Subbasin	Green Egg-to-Smolt Survival	NA	?		NA	?
		Tilton River	Green Egg-to-Smolt Survival	NA	?		NA	?
	Marking / Tagging Rate	Hatchery-origin	Integrated Hatchery Program	?	NA		?	NA
			Segregated Hatchery Program	?	NA		?	NA
			Total Hatchery	51.0%	NA	RMIS	?	NA
		Natural-origin	Lower Cowlitz River	NA	NA		?	NA
			Cispus River	NA	?		?	NA
			Upper Cowlitz River / Subbasin	NA	?		?	NA
			Tilton River	NA	?		?	NA
Survival to Maturity	Integrated Hatchery Program	Smolt Survival	to Mouth of Cowlitz River	?	NA		?	NA
			to Columbia River Estuary	?	NA		?	NA
		Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?	NA		?	NA
			Parr	?	NA		?	NA
			Smolts	?	NA		0.07%	NA
		Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?	NA		?	NA
			Parr	?	NA		?	NA
			Smolts	?	NA		2.09%	NA
		Productivity (Recruits / Spawner)	Smolts / Female Spawner	?	NA		700	NA
			Smolts / Adult+Jack Spawner	?	NA		1,399	NA
			Female-to-Female	?	NA		>>1	NA
			Adult-to-Adult	?	NA		>>1	NA
			Adult+Jack-to-Adult+Jack	?	NA		>>1	NA
			Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA		>>1	NA

Survival to Maturity

Segregated Hatchery Program	Smolt Survival	to Mouth of Cowlitz River	?	NA		NA	NA
		to Columbia River Estuary	?	NA		NA	NA
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?	NA		NA	NA
		Parr	?	NA		NA	NA
		Smolts	?	NA		NA	NA
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?	NA		NA	NA
		Parr	?	NA		NA	NA
		Smolts	?	NA		NA	NA
	Productivity (Recruits / Spawner)	Smolts / Female Spawner	?	NA		NA	NA
		Smolts / Adult+Jack Spawner	?	NA		NA	NA
		Female-to-Female	?	NA		NA	NA
		Adult-to-Adult	?	NA		NA	NA
Adult+Jack-to-Adult+Jack		?	NA		NA	NA	
Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack		?	NA		NA	NA	

Total Hatchery	Smolt Survival	to Mouth of Cowlitz River	?	NA		?	NA	
		to Columbia River Estuary	?	NA		?	NA	
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?	NA		?	NA	
		Parr	?	NA		?	NA	
		Smolts	?	NA		0.07%	NA	
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?	NA		?	NA	
		Parr	?	NA		?	NA	
		Smolts	0.435%	NA	RMIS	2.09%	NA	
	Productivity (Recruits / Spawner)	Smolts / Female Spawner	1,002	1,868	NA	ISIT, WDFW	700	NA
		Smolts / Adult+Jack Spawner	1,104	1,323	NA	ISIT, WDFW	1,399	NA
		Female-to-Female	?	NA		>>1	NA	
		Adult-to-Adult	?	NA		>>1	NA	
Adult+Jack-to-Adult+Jack		?	NA		>>1	NA		
Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack		?	NA		>>1	NA		

Survival to Maturity

Lower Cowlitz River Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	NA		NA	NA
	Smolt Passage (Transport) Survival	NA	NA		NA	NA
	Smolt Survival to Mouth of Cowlitz River	NA	?		NA	?
	Smolt Survival to Columbia River Estuary	NA	?		NA	?
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?		NA	?
		Parr	?		NA	?
		Smolts	?		NA	?
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?		NA	?
		Parr	?		NA	?
		Smolts	?		NA	?
	Productivity (Recruits / Spawner)	Smolts / Female Spawner	?	NA	NA	?
		Smolts / Adult+Jack Spawner	?	NA	NA	?
		Female-to-Female	?	NA	NA	>1
	Adult-to-Adult	Adult-to-Adult	?	NA	NA	>1
		Adult+Jack-to-Adult+Jack	?	NA	NA	>1
		Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA	NA	>1
Cispus River Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	75.6%	CFFF (TPU/WDFW)	NA	>75%
	Smolt Passage (Transport) Survival	NA	?		NA	>99%
	Smolt Survival to Mouth of Cowlitz River	NA	?		NA	NA
	Smolt Survival to Columbia River Estuary	NA	?		NA	NA
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?		NA	NA
		Parr	?		NA	NA
		Smolts	?		NA	NA
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?		NA	NA
		Parr	?		NA	NA
		Smolts	?		NA	NA
	Productivity (Recruits / Spawner)	Smolts / Female Spawner	?	NA	NA	NA
		Smolts / Adult+Jack Spawner	?	NA	NA	NA
		Female-to-Female	?	NA	NA	>1
	Adult-to-Adult	Adult-to-Adult	?	NA	NA	>1
		Adult+Jack-to-Adult+Jack	?	NA	NA	>1
		Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA	NA	>1

Survival to Maturity	Upper Cowlitz River/ Subbasin Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	75.6%	CFFF (TPU/WDFW)	NA	>75%
		Smolt Passage (Transport) Survival	NA	?		NA	>99%
		Smolt Survival to Mouth of Cowlitz River	NA	?		NA	NA
		Smolt Survival to Columbia River Estuary	NA	?		NA	NA
		Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	NA
		Parr	NA	?		NA	NA
		Smolts	NA	?		NA	NA
		Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	NA
		Parr	NA	?		NA	NA
		Smolts	NA	?		NA	NA
		Smolts / Female Spawner	?	NA		NA	NA
		Smolts / Adult+Jack Spawner	?	NA		NA	NA
		Productivity (Recruits / Spawner) Female-to-Female	?	NA		NA	>1
		Adult-to-Adult	?	NA		NA	>1
		Adult+Jack-to-Adult+Jack	?	NA		NA	>1
		Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA		NA	>1
	Tilton River Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	?		NA	>75%
		Smolt Passage (Transport) Survival	NA	?		NA	>99%
		Smolt Survival to Mouth of Cowlitz River	NA	?		NA	?
		Smolt Survival to Columbia River Estuary	NA	?		NA	?
		Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	?
		Parr	NA	?		NA	?
		Smolts	NA	?		NA	?
		Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	?
		Parr	NA	?		NA	?
		Smolts	NA	?		NA	?
		Smolts / Female Spawner	NA	?		NA	?
		Smolts / Adult+Jack Spawner	NA	?		NA	?
		Productivity (Recruits / Spawner) Female-to-Female	NA	?		NA	>1
		Adult-to-Adult	NA	?		NA	>1
		Adult+Jack-to-Adult+Jack	NA	?		NA	>1
		Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	NA	?		NA	>1

Proportional Natural Influence	Lower Cowlitz River	Collected/ Released	pHOS	NA		NA
			pNOB	NA		NA
			PNI	NA		NA
		Actual Spawners	pHOS	0.104	ISIT	<0.3
			pNOB	0.195	ISIT	NA
			PNI	0.584	ISIT	NA
	Cispus River	Collected/ Released	pHOS	?		<0.35
			pNOB	?		NA
			PNI	?		NA
		Actual Spawners	pHOS	?		<0.3
			pNOB	?		NA
			PNI	?		NA
	Upper Cowlitz River/Subbasin	Collected/ Released	pHOS	0.774	ISIT	<0.35
			pNOB	0.695	ISIT	>0.6
			PNI	0.443	ISIT	>0.63
		Actual Spawners	pHOS	?		<0.3
			pNOB	?		>0.6
			PNI	?		>0.67
	Tilton River	Collected/ Released	pHOS	0.570	ISIT	<0.35
			pNOB	?		NA
			PNI	?		NA
		Actual Spawners	pHOS	?		<0.3
			pNOB	?		NA
			PNI	?		NA
	Total	Collected/ Released	pHOS	0.309 - 0.698	ISIT, TPU, WDFW	<0.35
			pNOB	0.265 - 0.287	ISIT, TPU, WDFW	>0.6
			PNI	0.266 - 0.441	ISIT, TPU, WDFW	>0.63
		Actual Spawners	pHOS	0.526	ISIT	<0.3
			pNOB	0.195	ISIT	>0.6
			PNI	0.260	ISIT	>0.67

Big Table for Winter Steelhead. Management metrics and ranges of means for the most recent five years for hatchery- and natural-origin data that are available from ISIT, RMIS, Tacoma Power, and WDFW and FHMP adult goals. *Suggested recovery target for Stabilizing population.

Recovery Targets								Source(s) of Current Data	FHMP Adult Goal	
Lower Cowlitz River		Upper Cowlitz River								
400	500	500	200	Hatchery		Natural				
Metrics				Min	Max	Min	Max			
Data to be Collected (Numbers)										
Mature Returns										
Totals	Total Survivors to Maturity			?		?			11,296	1,926
	Total Escapement to Cowlitz River			?		?			11,296	1,926
Harvest	Fishery Location	Ocean	Commercial Fishery	?		?				
			Tribal Fishery	?		?				
			Sport Fishery	?		?				
			Total Ocean	0		0		ISIT	0	0
		Columbia River	Commercial Fishery	?		?				
			Tribal Fishery	?		?				
			Sport Fishery	?		?				
			Total Columbia River	0		0		ISIT	0	0
		Lower Cowlitz River	Commercial Fishery	?		?				
			Tribal Fishery	?		?				
			Sport Fishery	10,249		20		ISIT		
			Total Lower Cowlitz River	10,249		20		ISIT	10,249	20
		Above Mayfield Dam	Cispus River	?		?				
			Upper Cowlitz River	105		4		ISIT		
			Tilton River	30		6		ISIT		
			Total Above Mayfield Dam	135		9		ISIT	135	9
	Fishery Type	Commercial		?		?				
		Tribal		?		?				
		Sport		?		?				
Total Harvest			10,385		29		ISIT	10,385	73	

Stray -ing	Stray Origin	Cowlitz River	Outside Cowlitz Basin	?		?				0	0	
		Population	In Cowlitz Basin	?		?				0	0	
		Other Population Strays in Cowlitz River			?		?				0	0
Trapping	Lower Cowlitz Subbasin Tributary Traps	Delameter Creek	Released Below Weir	?		?					0	
			Released Above Weir	?		?						
			Kept for Broodstock	?		?					20	
			Mortalities	?		?		0			0	
			Killed	?		?					0	
			Total Caught	?		?					20	
		Lacamas Creek	Released Below Weir	?		?					0	
			Released Above Weir	?		?						
			Kept for Broodstock	?		?					20	
			Mortalities	?		?		0			0	
			Killed	?		?					0	
			Total Caught	?		?					20	
		Olequa Creek	Released Below Weir	?		?					0	
			Released Above Weir	?		?						
			Kept for Broodstock	?		?					20	
			Mortalities	?		?		0			0	
			Killed	?		?					0	
			Total Caught	?		?					20	
		Ostrander Creek	Released Below Weir	?		?					0	
			Released Above Weir	?		?						
			Kept for Broodstock	?		?					20	
			Mortalities	?		?		0			0	
			Killed	?		?					0	
			Total Caught	?		?					20	
	Cowlitz Salmon Hatchery	Hatchery Broodstock Collected			295	514	110	118	ISIT, TPU, WDFW	296	162	
		Released Below Dams			0	265	0	468	TPU, WDFW	0	0	
		Released Above Dams	Upper Cowlitz Subbasin			101	193	156	166	ISIT, TPU, WDFW	283	578
			Tilton Subbasin			14	72	205	303	TPU, WDFW	29	231
		Mortalities			1	137	0	12	TPU, WDFW	<10%	<10%	
		Surplus (Food Bank, Outplant, Nutrient Enhancement, etc)			3,032	3,450	0	4	TPU, WDFW	0	0	
		Total			3,811	4,015	568	1,059	TPU, WDFW	676	1,079	

Nature (pre-spawning)	Location	Below Dams	Lower Cowlitz River	Cowlitz River	180		645		ISIT	273	638	
				Out-of-Program Strays	?	?	?	?		0	0	
		Above Dams	Upper Cowlitz/Cispus Rivers			97		142		ISIT	236	550
			Tilton River			?		?			24	220
		Total				304		1,048		ISIT	534	1,408
Hatchery Production												
Spawners	Integrated Hatchery Program	Prespawn Mortalities			35	36	13	13	ISIT, WDFW	<27	<22	
		Killed, Not Spawned			?	?	?	?		0	0	
		Spawned			268	268	104	104	ISIT, WDFW	269	221	
	Segregated Hatchery Program	Prespawn Mortalities			158		NA			<75	NA	
		Killed, Not Spawned			?		NA			0	NA	
		Spawned			1,241		NA			0	NA	
	Total Hatchery	Prespawn Mortalities			35	36	13	13	ISIT, WDFW	<27	<22	
		Killed, Not Spawned			?	?	?	?		0	0	
		Spawned			263	268	104	107	ISIT, WDFW	269	221	
Offspring - Rearing and Release	Integrated Hatchery Program	Green Eggs Collected (Fecundity)		Mean	5,559 - 8,364				ISIT, WDFW	5,500	5,500	
				Total	700,192		148,664		WDFW	955,041		
		Eyed Eggs (Eyed Fecundity)		Mean	?	?	?	?		5,225	5,225	
				Total	?	?	?	?		868,219		
				Released	?	?	?	?		0	0	
		Fry	Fry Produced	Number	?	?	?	?		826,875		
				Size	?	?	?	?		?		
			Fry Released	Number	?	?	?	?		0		
				Size	?	?	?	?		NA		
		Parr	Parr Produced	Number	?	?	?	?		787,500		
				Size	?	?	?	?		?		
			Parr Released	Number	?	?	?	?		0		
				Size	?	?	?	?		NA		
		Smolts	Smolts Produced	Number	?					750,000		
				Size	?	?	?	?		?		
			Smolts Released	Number	407,481				WDFW	750,000		
		Size		?					?			
		Total Offspring Released				407,481				WDFW	CWT	
		Marks and Tags	Type: CWT	Number	?					150,000		

Offspring - Rearing and Release	Segregated Hatchery Program			Mean	NA	NA		0	NA		
				Total	NA	NA		0			
				Eyed Eggs (Eyed Fecundity)	Mean	NA	NA		0	NA	
					Total	NA	NA		0		
					Released	NA	NA		0	NA	
				Fry	Fry Produced	Number	NA	NA		0	
						Size	NA	NA		?	
					Fry Released	Number	NA	NA		0	
						Size	NA	NA		?	
				Parr	Parr Produced	Number	NA	NA		0	
						Size	NA	NA		?	
					Parr Released	Number	NA	NA		0	
						Size	NA	NA		?	
				Smolts	Smolts Produced	Number	NA	NA		0	
						Size	NA	NA		?	
					Smolts Released	Number	NA	NA		0	
						Size	NA	NA		?	
				Total Offspring Released			NA	NA		NA	
				Marks and Tags	Type: CWT	Number	NA	NA		0	
	Total Hatchery Programs			Mean	5,559 - 8,364		ISIT, WDFW	5,500	5,500		
Total				700,192	148,664	WDFW	955,041				
Eyed Eggs (Eyed Fecundity)				Mean	?	?		3,240			
				Total	?	?		2,546,775			
				Released	?	?		0			
Fry				Fry Produced	Number	?	?		826,875		
					Size	?	?		?		
				Fry Released	Number	?	?		0		
					Size	?	?		NA		
Parr				Parr Produced	Number	?	?		787,500		
					Size	?	?		?		
				Parr Released	Number	?	?		0		
					Size	?	?		NA		
Smolts				Age-2 Smolts Produced	Number	?			750,000		
					Size	?	?		?		
	Age-2 Smolts Released	Number	407,481		WDFW	750,000					
		Size	?			?					
Total Offspring Released			407,481		WDFW	CWT					
Marks and Tags	Type: CWT	Number	?			150,000					

Natural Production												
Below Dams	Lower Cowlitz River Mainstem	Spawners	Prespawn Mortalities in Nature	Lower Cowlitz River	?	?		?	?	?		
				Out-of-Program Strays	?	?		0	0	?	?	
			Spawners in Nature	Lower Cowlitz River	162		580		ISIT	?	?	
				Out-of-Basin Strays	?	?		0	0	?	?	
		Offspring	Total Eggs Laid			?	?	?	?	?	?	
			Smolts Produced			?				?	?	
			Smolts Trapped & Released	Number Trapped			NA				NA	NA
				Number Released			NA				NA	NA
				Type of Mark/Tag			NA				NA	NA
				Number Marked/Tagged			NA				NA	NA
	Lower Cowlitz River Tributaries	Spawners	Prespawn Mortalities in Nature	Lower Cowlitz River	?	?	?	?		<18	<63	
				Out-of-Program Strays	?	?	?	?		0	0	
			Spawners in Nature	Lower Cowlitz River	?	?	?	?		162	580	
				Out-of-Basin Strays	?	?	?	?		0	0	
		Offspring	Total Eggs Laid			?	?	?	?		892,980	3,191,760
			Smolts Produced			?					0	0
			Smolts Trapped & Released	Number Trapped			NA				NA	NA
				Number Released			NA				NA	NA
				Type of Mark/Tag			NA				NA	NA
				Number Marked/Tagged			NA				NA	NA

Above Dams	Cispus River	Spawners	Prespawn Mortalities in Nature	Cispus River	?	?		<10	<25
			Out-of-Program Strays	?	?		0	0	
			Spawners in Nature	Cispus River	?	?		107	250
			Out-of-Basin Strays	?	?		0	0	

Above Dams	Cispus River	Offspring	Total Eggs Laid	?	?		589,286	1,375,000
			Smolts Produced	?			8,333	
			Number Trapped	?			6,250	
			Number Released	?	?		6,250	
			Type of Mark/Tag	?	?		NA	
			Number Marked/Tagged	?	?		0	
	Upper Cowlitz Subbasin	Spawners	Prespawn Mortalities in Nature	Upper Cowlitz River	?	?	<10	<25
				Out-of-Program Strays	?	?	0	0
			Spawners in Nature	Upper Cowlitz River	?	?	107	250
				Out-of-Program Strays	?	?	0	0
		Offspring	Total Eggs Laid	?	?		589,286	1,375,000
			Smolts Produced	13,270		CFFF (TPU/WDFW)	8,333	
			Number Trapped	9,439		CFFF (TPU/WDFW)	6,250	
			Number Released	?			6,250	
			Type of Mark/Tag	NA			NA	
			Number Marked/Tagged	?			0	
	Tilton River	Spawners	Prespawn Mortalities in Nature	Tilton River	?	?	<8	<20
				Out-of-Program Strays	?	?	0	0
			Spawners in Nature	Tilton River	?	?	86	200
				Out-of-Program Strays	?	?	0	0
		Offspring	Total Eggs Laid	?	?		471,429	1,100,000
			Smolts Produced	?			6,667	
			Number Trapped	7,649		TPU Mayfield	5,000	
			Number Released	?			5,000	
			Type of Mark/Tag	NA			CWT	
			Number Marked/Tagged	?			5,000	

Above Dams	Total	Spawners	Prespawn	Tilton River	?	?		<257	<600		
			Mortalities in Nature	Out-of-Program Strays	?	?		0	0		
			Spawners in Nature	Tilton River	?	?		300	700		
				Out-of-Program Strays	?	?		0	0		
		Offspring	Total Eggs Laid		?	?		1,650,000	3,850,000		
			Smolts Produced		?				23,333		
			Number Trapped		17,089			TPU Mayfield	17,500		
				Smolts Trapped & Released		?				17,500	
				Type of Mark/Tag		NA				CWT	
				Number Marked/Tagged		?				5,000	
Smolt Migration											
Smolts	Location	Number of Smolts in Lower Cowlitz River	Lower Cowlitz River	?	?		750,000	20,000			
			Cispus River	?	?		0	6,250			
			Upper Cowlitz River	?	?		0	0			
			Tilton River	?	?		0	5,000			
			Total	?	?		750,000	37,500			
		Number of Smolts at Mouth of Cowlitz River	Lower Cowlitz River	?	?		?	?			
			Cispus River	?	?		?	?			
			Upper Cowlitz River	?	?		?	?			
			Tilton River	?	?		?	?			
			Total	?	?		?	?			
		Number of Smolts in Columbia River Estuary	Lower Cowlitz River	?	?		?	?			
			Cispus River	?	?		?	?			
			Upper Cowlitz River	?	?		?	?			
			Tilton River	?	?		?	?			
			Total	?	?		?	?			
Management Metrics (Rates to be Calculated Using the Data Collected Above)											
Adult Salmon	Harvest Rate	Ocean	Commercial	?	?	?	?	?	?		
			Tribal	?	?	?	?	?	?		
			Sport	?	?	?	?	0%	0%		
			Total Ocean	0%		0%		ISIT, TPU	?	?	
		Columbia River	Commercial	?	?	?	?	?	?		
			Tribal	?	?	?	?	?	?		
			Sport	?	?	?	?	0%	0%		
			Total Columbia River	0%		0%		ISIT, TPU	?	?	

Adult Salmon	Harvest Rate	Cowlitz River	Lower Cowlitz River	Commercial	?	?	?	?		?	?
				Tribal	?	?	?	?		?	?
				Sport						?	?
				Total Cowlitz River	71.0%		1.6%		ISIT, TPU	71%	2%
		Above Mayfield Dam - Sport	Upper Cowlitz Subbasin	0.7%		0.3%		ISIT, TPU	1%	0%	
			Tilton Subbasin	0.2%		0.4%		ISIT, TPU	0%	0%	
			Total Above Mayfield Dam	0.9%		2.3%		ISIT, TPU	1%	2%	
		Total Harvest	Commercial	?	?	?	?		?	?	
			Tribal	?	?	?	?		?	?	
			Sport	?	?	?	?		?	?	
			Total	71.8%		2.3%		ISIT, TPU	72%	2%	
	Stray Rate	Cowlitz River Salmon	Out-of-Basin	?		?			<5%	<5%	
			Cowlitz Basin	?		?			<5%	<5%	
			Total	?		?			<5%	<5%	
		Out-of-Basin Strays Into Cowlitz River			?		?			<5%	<5%
	Trapped at Barrier Dam	Lower Cowlitz River	Percentage of Cowlitz Salmon Hatchery Collection	Trapping Rate (% of Returns to Cowlitz River)	26.6%		NA		ISIT, TPU, WDFW	?	NA
				Hatchery Broodstock	14.5%		NA		ISIT, TPU, WDFW	?	NA
				Released Below Dams	0.0%		NA		ISIT, TPU, WDFW	?	NA
				Released Above Dams	1.5%		NA		ISIT, TPU, WDFW	?	NA
				Mortalities	0.0%		NA		ISIT, TPU, WDFW	?	NA
				Surplus	79.4%		NA		ISIT, TPU, WDFW	?	NA
				Tilton River	Percentage of Cowlitz Salmon Hatchery Collection	Trapping Rate (% of Returns to Cowlitz River)	26.6%		47.7%		ISIT, TPU, WDFW
		Hatchery Broodstock	14.5%			19.5%		ISIT, TPU, WDFW	?	?	
		Released Below Dams	0.0%			0.0%		ISIT, TPU, WDFW	?	?	
		Released Above Dams	1.5%			53.9%		ISIT, TPU, WDFW	?	?	
		Mortalities	0.0%			26.1%		ISIT, TPU, WDFW	?	?	
		Surplus			79.4%		0.0%		ISIT, TPU, WDFW	?	?

Adult Salmon	Trapped at Barrier Dam	Upper Cowlitz Subbasin	Percentage of Cowlitz Salmon Hatchery Collection	Trapping Rate (% of Returns to Cowlitz River)	26.6%	47.7%	ISIT, TPU, WDFW	?	?
				Hatchery Broodstock	14.5%	19.5%	ISIT, TPU, WDFW	?	?
				Released Below Dams	0.0%	0.0%	ISIT, TPU, WDFW	?	?
				Released Above Dams	1.5%	53.9%	ISIT, TPU, WDFW	?	?
				Mortalities	0.0%	26.1%	ISIT, TPU, WDFW	?	?
				Surplus	79.4%	0.0%	ISIT, TPU, WDFW	?	?
		Total	Percentage of Cowlitz Salmon Hatchery Collection	Trapping Rate (% of Returns to Cowlitz River)	26.6%	47.7%	ISIT, TPU, WDFW	?	?
				Hatchery Broodstock	14.5%	19.5%	ISIT, TPU, WDFW	?	?
				Released Below Dams	0.0%	0.0%	ISIT, TPU, WDFW	?	?
				To Tilton Subbasin	1.5%	53.9%	ISIT, TPU, WDFW	?	?
				To Upper Cowlitz Subbasin	0.0%	26.1%	ISIT, TPU, WDFW	?	?
				Mortalities	79.4%	0.0%	ISIT, TPU, WDFW	?	?
				Surplus	14.5%	0.5%	ISIT, TPU, WDFW	?	?
	Age (Run Year - Brood Year)	Integrated Hatchery Program	Age Composition (proportion)	Mean Age	?	NA		?	NA
				Age-2	?	NA		?	NA
				Age-3	?	NA		?	NA
				Age-4	?	NA		?	NA
				Age-5	?	NA		?	NA
				Age-6	?	NA		?	NA
				Age-7	?	NA		?	NA
		Segregated Hatchery Program	Age Composition (proportion)	Mean Age	?	NA		?	NA
				Age-2	?	NA		?	NA
				Age-3	?	NA		?	NA
				Age-4	?	NA		?	NA
				Age-5	?	NA		?	NA
				Age-6	?	NA		?	NA
				Age-7	?	NA		?	NA

Adult Salmon	Age (Run Year - Brood Year)	Total Hatchery	Mean Age	?	NA		?	NA
			Age-2	?	NA		?	NA
			Age-3	?	NA		?	NA
			Age-4	?	NA		?	NA
			Age-5	?	NA		?	NA
			Age-6	?	NA		?	NA
			Age-7	?	NA		?	NA
		Lower Cowlitz Subbasin Natural-origin	Mean Age	NA	?		NA	?
			Age-2	NA	?		NA	?
			Age-3	NA	?		NA	?
			Age-4	NA	?		NA	?
			Age-5	NA	?		NA	?
			Age-6	NA	?		NA	?
			Age-7	NA	?		NA	?
		Upper Cowlitz Subbasin Natural-origin	Mean Age	NA	?		NA	?
			Age-2	NA	?		NA	?
			Age-3	NA	?		NA	?
			Age-4	NA	?		NA	?
			Age-5	NA	?		NA	?
			Age-6	NA	?		NA	?
			Age-7	NA	?		NA	?
		Tilton Subbasin Natural-origin	Mean Age	NA	?		NA	?
			Age-2	NA	?		NA	?
			Age-3	NA	?		NA	?
			Age-4	NA	?		NA	?
			Age-5	NA	?		NA	?
			Age-6	NA	?		NA	?
			Age-7	NA	?		NA	?
		Total Natural-origin	Mean Age	NA	?		NA	?
			Age-2	NA	?		NA	?
			Age-3	NA	?		NA	?
			Age-4	NA	?		NA	?
			Age-5	NA	?		NA	?
			Age-6	NA	?		NA	?
			Age-7	NA	?		NA	?

Spawning	In Hatchery	Integrated Hatchery Program	Prespawn Mortality Rate	11.3%		ISIT	<10%	<10%
			Mean Fecundity	5,559 - 8,364		ISIT, WDFW	5,500	5,500
			Mean Eyed Fecundity	?	?		5,225	5,225
			Fertility	?	?		95%	95%
		Segregated Hatchery Program	Prespawn Mortality Rate	NA	NA		NA	NA
			Mean Fecundity	NA	NA		NA	NA
			Mean Eyed Fecundity	NA	NA		NA	NA
			Fertility	NA	NA		NA	NA
		Total Hatchery	Prespawn Mortality Rate	9.8%		ISIT	<10%	<10%
			Mean Fecundity	5,559 - 8,364		ISIT, WDFW	5,500	5,500
			Mean Eyed Fecundity	?	?		5,225	5,225
			Fertility	?	?		95%	95%
	In Nature	Lower Cowlitz River	Prespawn Mortality Rate	?	?		<10%	<10%
			Mean Fecundity	?	?		5,500	5,500
		Cispus River	Prespawn Mortality Rate	?	?		<10%	<10%
			Mean Fecundity	?	?		5,500	5,500
		Upper Cowlitz River / Subbasin	Prespawn Mortality Rate	?	?		<10%	<10%
			Mean Fecundity	?	?		5,500	5,500
		Tilton River	Prespawn Mortality Rate	?	?		<10%	<10%
			Mean Fecundity	?	?		5,500	5,500
Survival of Offspring to Smolt Stage	In Hatchery	Integrated Hatchery Program	Fertility Rate	?	?		95%	NA
			Eyed Egg-to-Fry Survival	?	NA		95%	NA
			Fry-to-Parr Survival	?	NA		95%	NA
			Parr-to-Smolt Survival	?	NA		95%	NA
			Green Egg-to-Smolt Survival	60.5% - 75.7%		WDFW	81%	NA
		Segregated Hatchery Program	Fertility Rate	?	?		95%	NA
			Eyed Egg-to-Fry Survival	?	NA		95%	NA
			Fry-to-Parr Survival	?	NA		95%	NA
			Parr-to-Smolt Survival	?	NA		95%	NA
			Green Egg-to-Smolt Survival	?	NA		81%	NA
		Total Hatchery	Fertility Rate	?	?		95%	NA
			Eyed Egg-to-Fry Survival	?	NA		95%	NA
			Fry-to-Parr Survival	?	NA		95%	NA
			Parr-to-Smolt Survival	?	NA		95%	NA
			Green Egg-to-Smolt Survival	60.5% - 75.7%		WDFW	81%	NA

Survival of Offspring to Smolt Stage	In Nature	Lower Cowlitz River	Green Egg-to-Smolt Survival	NA	?		NA	?
		Cispus River	Green Egg-to-Smolt Survival	NA	?		NA	?
		Upper Cowlitz River / Subbasin	Green Egg-to-Smolt Survival	NA	?		NA	?
		Tilton River	Green Egg-to-Smolt Survival	NA	?		NA	?
	Marking / Tagging Rate	Hatchery-origin	Integrated Hatchery Program	?	NA		?	NA
			Segregated Hatchery Program	?	NA		?	NA
			Total Hatchery	?	NA		?	NA
		Natural-origin	Lower Cowlitz River	NA	NA		?	NA
			Cispus River	NA	?		?	NA
			Upper Cowlitz River / Subbasin	NA	?		?	NA
Tilton River			NA	?		?	NA	
Survival to Maturity	Integrated Hatchery Program	Smolt Survival	to Mouth of Cowlitz River	?	NA		?	NA
			to Columbia River Estuary	?	NA		?	NA
		Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?	NA		?	NA
			Parr	?	NA		?	NA
			Smolts	0.69%	NA	ISIT	0.69%	NA
		Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?	NA		?	NA
			Parr	?	NA		?	NA
			Smolts	2.56%	NA	ISIT	2.56%	NA
		Productivity (Recruits / Spawner)	Smolts / Female Spawner	4,426	NA	ISIT	4,426	NA
			Smolts / Adult+Jack Spawner	2,096	NA	ISIT	2,096	NA
			Female-to-Female	?	NA		>>1	NA
			Adult-to-Adult	15.2	NA	ISIT	15.2	NA
			Adult+Jack-to-Adult+Jack	?	NA		>>1	NA
			Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA		>>1	NA

Survival to Maturity

Segregated Hatchery Program	Smolt Survival	to Mouth of Cowlitz River	?	NA		NA	NA
		to Columbia River Estuary	?	NA		NA	NA
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?	NA		NA	NA
		Parr	?	NA		NA	NA
		Smolts	?	NA		NA	NA
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?	NA		NA	NA
		Parr	?	NA		NA	NA
		Smolts	?	NA		NA	NA
	Productivity (Recruits / Spawner)	Smolts / Female Spawner	?	NA		NA	NA
		Smolts / Adult+Jack Spawner	?	NA		NA	NA
		Female-to-Female	?	NA		NA	NA
		Adult-to-Adult	?	NA		NA	NA
		Adult+Jack-to-Adult+Jack	?	NA		NA	NA
		Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA		NA	NA
Total Hatchery	Smolt Survival	to Mouth of Cowlitz River	?	NA		?	NA
		to Columbia River Estuary	?	NA		?	NA
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery)	Fry	?	NA		?	NA
		Parr	?	NA		?	NA
		Smolts	0.69%	NA	ISIT	0.69%	NA
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for)	Fry	?	NA		?	NA
		Parr	?	NA		?	NA
		Smolts	2.56%	NA	ISIT	2.56%	NA
	Productivity (Recruits / Spawner)	Smolts / Female Spawner	4,426	NA	ISIT	4,426	NA
		Smolts / Adult+Jack Spawner	2,096	NA	ISIT	2,096	NA
		Female-to-Female	?	NA		>>1	NA
		Adult-to-Adult	15.2	NA	ISIT	15.2	NA
		Adult+Jack-to-Adult+Jack	?	NA		>>1	NA
		Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	NA		>>1	NA

Survival to Maturity

Lower Cowlitz River Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	NA		NA	NA
	Smolt Passage (Transport) Survival	NA	NA		NA	NA
	Smolt Survival to Mouth of Cowlitz River	NA	?		NA	?
	Smolt Survival to Columbia River Estuary	NA	?		NA	?
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	?
	Parr	NA	?		NA	?
	Smolts	NA	?		NA	>4%
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	?
	Parr	NA	?		NA	?
	Smolts	NA	?		NA	>6%
	Smolts / Female Spawner	NA	?		NA	>200
	Smolts / Adult+Jack Spawner	NA	?		NA	>100
	Productivity (Recruits / Spawner) Female-to-Female	NA	?		NA	>1
	Adult-to-Adult	NA	1.88	ISIT	NA	>1
	Adult+Jack-to-Adult+Jack	NA	?		NA	>1
	Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	NA	?		NA	>1
Cispus River Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	68.9%	CFFF (TPU/WDFW)	NA	>75%
	Smolt Passage (Transport) Survival	NA	?		NA	>99%
	Smolt Survival to Mouth of Cowlitz River	NA	?		NA	?
	Smolt Survival to Columbia River Estuary	NA	?		NA	?
	Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	?
	Parr	NA	?		NA	?
	Smolts	NA	5.72%	ISIT	NA	>3.5%
	Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	?
	Parr	NA	?		NA	?
	Smolts	NA	6.09%	ISIT	NA	>4%
	Smolts / Female Spawner	?	?		NA	>200
	Smolts / Adult+Jack Spawner	?	124	ISIT	NA	>100
	Productivity (Recruits / Spawner) Female-to-Female	?	?		NA	>1
	Adult-to-Adult	?	0.60	ISIT	NA	>1
	Adult+Jack-to-Adult+Jack	?	?		NA	>1
	Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	?		NA	>1

Survival to Maturity	Upper Cowlitz River/ Subbasin Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	68.9%	CFFF (TPU/WDFW)	NA	>75%
		Smolt Passage (Transport) Survival	NA	?		NA	>99%
		Smolt Survival to Mouth of Cowlitz River	NA	?		NA	?
		Smolt Survival to Columbia River Estuary	NA	?		NA	?
		Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	?
		Parr	NA	?		NA	?
		Smolts	NA	5.72%	ISIT	NA	>3.5%
		Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	?
		Parr	NA	?		NA	?
		Smolts	NA	6.09%	ISIT	NA	>4%
		Smolts / Female Spawner	?	?		NA	>200
		Smolts / Adult+Jack Spawner	?	124	ISIT	NA	>100
		Productivity (Recruits / Spawner) Female-to-Female	?	?		NA	>1
		Adult-to-Adult	?	0.60	ISIT	NA	>1
		Adult+Jack-to-Adult+Jack	?	?		NA	>1
		Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	?	?		NA	>1
	Tilton River Natural-origin	Freshwater Survival/Conversion/ Collection Efficiency	NA	?		NA	>75%
		Smolt Passage (Transport) Survival	NA	?		NA	>99%
		Smolt Survival to Mouth of Cowlitz River	NA	?		NA	?
		Smolt Survival to Columbia River Estuary	NA	?		NA	?
		Smolt-to-Adult Return Rate (SAR; to Cowlitz Salmon Hatchery) Fry	NA	?		NA	?
		Parr	NA	?		NA	?
		Smolts	NA	3.65%	ISIT	NA	>5%
		Total Smolt-to-Adult Survival Rate (TSAR; all maturing/mature salmon that can be accounted for) Fry	NA	?		NA	?
		Parr	NA	?		NA	?
		Smolts	NA	3.90%	ISIT	NA	>6%
		Smolts / Female Spawner	NA	?		NA	>200
		Smolts / Adult+Jack Spawner	NA	51	ISIT	NA	>100
		Productivity (Recruits / Spawner) Female-to-Female	NA	?		NA	>1
		Adult-to-Adult	NA	2.51	ISIT	NA	>1
		Adult+Jack-to-Adult+Jack	NA	?		NA	>1
		Adult+Jack+Mini-Jack-to-Adult+Jack+Mini-Jack	NA	?		NA	>1

Proportional Natural Influence	Lower Cowlitz River	Collected/ Released	pHOS	0.229	ISIT	<0.35
			pNOB	NA		>0.6
			PNI	NA		>0.63
		Actual Spawners	pHOS	NA		<0.3
			pNOB	NA		>0.3
			PNI	NA		>0.5
	Cispus River	Collected/ Released	pHOS	0.541	ISIT	<0.35
			pNOB	0.199	ISIT	>0.6
			PNI	0.399	ISIT	>0.63
		Actual Spawners	pHOS	?		<0.3
			pNOB	0.289	ISIT	>0.6
			PNI	?		>0.67
	Upper Cowlitz River/Subbasin	Collected/ Released	pHOS	0.541	ISIT	<0.35
			pNOB	0.199	ISIT	>0.6
			PNI	0.399	ISIT	>0.63
		Actual Spawners	pHOS	?		<0.3
			pNOB	0.289	ISIT	>0.6
			PNI	?		>0.67
	Tilton River	Collected/ Released	pHOS	0.112	ISIT	<0.35
			pNOB	0.908	ISIT	>0.6
			PNI	0.890	ISIT	>0.63
		Actual Spawners	pHOS	?		<0.3
			pNOB	0.908	ISIT	>0.6
			PNI	?		>0.67
	Total	Collected/ Released	pHOS	0.280	ISIT	<0.35
			pNOB	0.199	ISIT	>0.6
			PNI	0.447	ISIT	>0.63
		Actual Spawners	pHOS	?		<0.3
			pNOB	0.289	ISIT	>0.6
			PNI	?		>0.67

APPENDIX B: TRANSITION PLANS

Appendix B

Transition Plans

As described in FHMP Chapters 3-9, during the period covered by this FHMP, the intent is to transition programs for fall Chinook Salmon, spring Chinook Salmon, Coho Salmon, and winter steelhead in order to advance recovery efforts, while maintaining angling opportunity. One of the critical steps in this transition is the development of Transition Plans that will include the development of key Decision Rules. The development of these Decision Rules will require an analysis of high-level limiting factors to determine critical thresholds to shift the programs. Some of these programs may implement a sliding scale or “stepping-stone” approach, while others will likely require consideration for additional triggers associated with harvest management, spatial distribution, broodstock integration, and other key transition considerations.

As described in FHMP Chapter 12, Adaptive Management, Tacoma Power will work with the FTC in developing Decision Rules to incorporate into each Transition Plan. These will vary, depending on natural-origin adult abundance to the spawning grounds (for Lower Cowlitz Subbasin populations) or to the Cowlitz Barrier Dam (for populations above Mayfield and Cowlitz Falls dams) and the current recovery phase. These Decision Rules will be incorporated into a predictive model. This information will then be used to create a population-level annual management plan of the full suite of anticipated scenarios. The development of these plans will also include a public comment period.

General Steps for Transition Plans

The following outlines the general steps/topics that should be addressed in the development of Transition Plans associated with changes in hatchery programs (e.g., Segregated to Integrated, and/or transition from Lower Cowlitz to Upper Cowlitz programs). Transition Plans need to be developed for the fall Chinook Salmon, spring Chinook Salmon, Coho Salmon, and winter steelhead programs.

- Transition Plans should consider:
 - High-Level Steps for Hatchery Program Development:
 - Define goal(s) of program
 - Conservation/Harvest (by step and recovery phase)
 - Population(s) impacted
 - Consider Management Strategies to achieve program goals
 - Harvest
 - Transport/Disposition Strategies
 - Range (minimum and maximum)
 - Define type of program (Integrated vs. Segregated) – current and proposed
 - Define size (and range) of program
 - Determine transition approach and schedule (timeframe programs will change) and/or trigger points
 - Immediate switch vs. “stepping-stone” transition
 - Integration rate goals during transition – fixed vs. sliding scale
 - Define acceptable pNOB levels (i.e., broodstock mining rates)
 - Define adult collection plan
 - Broodstock source(s)

- Collection location/methods
 - Collection timing curves
- Define contingency plan for lack of adults (i.e., secondary sources/options)
- Define marking/tagging strategy (including any overlap during transition)
 - Consider what type of evaluation needs to occur
- Define time and size of release and any growth manipulation (outside of standard practice) during rearing
- Define monitoring and data needs to support program transition
 - Identify Adaptive Management trigger points
- Evaluation of program feasibility
 - Evaluate programs within the proposed suite of all hatchery programs (i.e., overall capacity for facility, bio-programming)
 - Identify hatchery infrastructure changes needed
 - Steps to achieve these
- Other Program Effects:
 - A description of how harvest mitigation will be achieved in the long term for both upper and lower rivers.
 - Production floors (i.e., for the upper Cowlitz River releases) to ensure that harvest goals are met.
 - For integrated programs - Analysis to determine if the population can support the needed level of broodstock mining and if this plan will prevent or delay the populations from reaching “healthy and harvestable” levels.
 - An acknowledgement that if the plan cannot meet recovery and fishery goals, the plan would need to be altered (i.e., adaptive management).
 - Evaluation of applicability of HSRG guidelines during each step of recovery.

A summary of the proposed transitions for each program, the timing to develop the Transition Plans, and the interim strategies and consideration for implementation while the Transition Plans are being developed is presented in Table 12-2.

APPENDIX C:

SUMMARY OF DATA GAPS AND POTENTIAL FUTURE MONITORING NEEDS

Appendix C: Data Gaps and Potential Future Monitoring Needs

Appendix C is a comprehensive list identifying current areas of monitoring and existing data gaps as presented in the fish species and population chapters of the 2020 FHMP. The following Summary of Data Gaps and Potential Future Monitoring Needs matrices clearly identify baseline and directed monitoring data gaps that will require consideration for prioritization during this FHMP period, as described in Chapters 3 through 9. The summary matrices are intended as a working tool to help identify critical data needs required for tracking recovery metrics and management decisions during each recovery phase during this FHMP period, the results of which will require incorporation into a consolidated database and summarization into the Big Table Dataset. Separate summary matrices are presented below, by species.

Table C-1: Data Gaps and Potential Future Monitoring Needs for Fall Chinook Salmon

Topic/Theme	Summary of Data Gap/Potential Future Monitoring Need	Affected Populations ¹
Data Collection	Summarize Data and Assumptions for Fall Chinook Salmon into a single shared database for Analysis and Reporting	All
	Consider Methods to Improve Estimating Abundance in Harvest and on Spawning Grounds	All
	Incorporate Data into Consolidated Database Characterizing Age Structure and Sexes	All
	Incorporate Lower Cowlitz Salmon Hatchery Program Data into Consolidated Database and Consider Additional Improvements in M&E to Inform Fisheries Strategies	All
Stock Identification	Genetic Structure of the Fall Chinook Salmon Populations in the Cowlitz Basin	All
	Differentiating Natural-Origin Fall vs. Spring Chinook Salmon	UCS/TS
	Genetic Structure of the Fall Chinook Salmon Populations in the Cowlitz Basin	All
	Differentiating Natural-Origin of Fall vs. Spring Chinook Salmon	UCS/TS
Smolt Monitoring	Monitoring and Estimating Abundance of Smolts Leaving the Cowlitz River	All
	Understanding Fall Chinook Salmon Production from the Lower Cowlitz Subbasin	LCS
	Understanding Fall Chinook Salmon Production from the Tilton Subbasin	UCS/TS
	Natural Mortality of Outmigrating Juveniles	All
	Monitor Dam Passage Survival for Tilton Subbasin Fall Chinook Salmon and Fish Guidance Efficiency at Mayfield Dam	UCS/TS
Survival, Productivity, and Age Composition	Smolt-to-Adult Return and Total Smolt-to-Adult Survival for Hatchery-Origin and Natural-Origin Fall Chinook Salmon	All
	Productivity (Recruits/Spawner) of Hatchery-Origin and Natural-Origin Fall Chinook Salmon	All
	Juvenile Productivity (Smolts/Spawner)	All

Topic/Theme	Summary of Data Gap/Potential Future Monitoring Need	Affected Populations ¹
	• Adult Productivity (Adult Recruits/Parental Spawner)	All
	• Consolidate Age Composition of Hatchery-Origin and Natural-Origin Fall Chinook Salmon into Single Database for Analysis and Reporting	All
Spawning in Nature	• Estimate Adult Fall Chinook Salmon Transported Above Mayfield Dam	UCS/TS
	• Estimates of Total Fall Chinook Salmon in the Lower Cowlitz Subbasin	LCS
	• Estimate Straying in the Lower Cowlitz Subbasin and Elsewhere	All
Hatchery Practices	• Develop Methods to Evaluate Strategies for Improving Survival in the Hatchery, After Release, and Age Composition (Including Precocious Maturation)	All
	• Develop Methods to Evaluate Rearing and Release Strategies to Improve Survival and Age Composition	UCS
Pathology	• Effects of <i>Ceratonova shasta</i> on Upper Cowlitz Subbasin Fall Chinook Salmon	UCS/TS

¹ LCS = Lower Cowlitz Subbasin; TS = Tilton Subbasin; UCS = Upper Cowlitz Subbasin

Table C-2: Data Gaps and Potential Future Monitoring Needs for Spring Chinook Salmon

Topic/Theme	Summary of Data Gap/Potential Future Monitoring Need	Affected Populations¹
Data Collection	Summarize Data and Assumptions for Spring Chinook Salmon into a Single Shared Database for Analysis and Reporting	All
	Consider Improvements for Monitoring, Evaluation, and Data Collection Efforts for UCS Spring Chinook Salmon	UCS
	Harvest Estimates of UCS Spring Chinook Salmon in the Pacific Ocean, Columbia River, Lower Cowlitz River, and Upper Cowlitz Subbasin	UCS
	Monitor Trend of Hatchery-Origin Spring Chinook Salmon Mini-jacks and Jacks and Natural-Origin Jacks	UCS
	Document Returns of Hatchery-Origin and Natural-Origin Spring Chinook Salmon by Age and Additional Data Needs to Estimate SAR, TSAR, Productivity, and Age Composition	UCS
Stock Identification	Identify the True Origin of NOR Spring Chinook Salmon Returning to Barrier Dam Adult Facility	UCS
	Ability to Distinguish between Spring and Fall Chinook Salmon smolts Originating from the Upper Cowlitz Subbasin	UCS
	Mis-clip Rates for Returning Adults	UCS
Smolt Monitoring	Ability to Distinguish between Spring and Fall Chinook Salmon smolts Originating from the Upper Cowlitz Subbasin	UCS
	Spring Chinook Smolt Migration Timing and Survival	UCS
Survival, Productivity, and Age Composition	Smolt-to-Adult Return and Total Smolt-to-Adult Survival for Hatchery-Origin and Natural-Origin Spring Chinook Salmon	UCS
	Productivity (Recruits/Spawner) of Hatchery-Origin and Natural-Origin Spring Chinook Salmon	UCS

Topic/Theme	Summary of Data Gap/Potential Future Monitoring Need	Affected Populations ¹
	• Juvenile Productivity (Smolts/Spawner)	UCS
	• Adult Productivity (Adult Recruits/Parental Spawner)	UCS
	• Consolidate Age Composition of Hatchery-Origin and Natural-Origin Spring Chinook Salmon into Single Database for Analysis and Reporting	UCS
Spawning in Nature	• Estimate Spawner Abundance and Pre-spawn Survival of Upper Cowlitz Subbasin Spring Chinook Salmon	UCS
Hatchery Practices	• Number of Upper Cowlitz Subbasin Spring Chinook Salmon Jacks vs. Adults Spawned at Cowlitz Salmon Hatchery	UCS
	• Develop Methods to Evaluate Rearing and Release Strategies to Improve Survival and Age Composition	UCS
	• Monitor Trend of UCS Spring Chinook HOR Mini-jacks and HOR and NOR Jacks	UCS
Proportionate Natural Influence	• Identify Limiting Factors for Spring Chinook Salmon that Influence PNI and pHOS	UCS
VSP Parameters	• Develop Criteria using VSP Parameters for the Eventual Release of Spring Chinook Salmon into the Tilton Subbasin	UCS

¹ UCS = Upper Cowlitz Subbasin

Table C-3: Data Gaps and Potential Future Monitoring Needs for Coho Salmon

Topic/Theme	Summary of Data Gap/Potential Future Monitoring Need	Affected Populations¹
Data Collection	Summarize Data and Assumptions for Coho Salmon into a Single Shared database for Analysis and Reporting	All
	Incorporate Data into Consolidated Database Characterizing Age, Sex, and Origin of all Recoveries	All
	Determine Goal of the Creel Survey (Coho)	All
	Maintain M&E Program for Lower Cowlitz Subbasin Coho Salmon	LCS
	Continue Spawning Ground Surveys for Lower Cowlitz Subbasin Coho Salmon (including Estimates for Pre-spawn Mortality, Spawner Abundance)	LCS
	Numbers of Natural-Origin Upper Cowlitz Subbasin Coho Salmon that Return at Maturation and their Disposition	UCS, TS
	Consider Spawning Ground Surveys for Upper Cowlitz Subbasin and Tilton Coho (Pre-spawn Mortality, Spawner Abundance)	UCS, TS
	Baseline and Directed Studies for Upper Cowlitz Subbasin Coho Salmon	UCS
	Document and Consider Testing Assumptions for Fallback Rates (e.g., 12%) and Pre-spawn Mortality Rate (e.g., 10%) for Tilton Subbasin Coho Salmon	TS
Stock Identification	Origin of Spawners in the Lower Cowlitz River vs. Tilton Subbasin	LCS, TS
Smolt Monitoring	Estimates of Natural Smolt Abundance for Lower Cowlitz Subbasin Coho Salmon	LCS
	Natural-Origin Smolt Production from the Tilton Subbasin	TS
	Age of Coho Salmon Migrants Leaving the Upper Cowlitz Subbasin and Tilton Subbasin - Scale Age and Length assumptions	UCS; TS
	Natural Mortality of Outmigrating Juveniles	All

Topic/Theme	Summary of Data Gap/Potential Future Monitoring Need	Affected Populations ¹
	Monitor Dam Passage Survival for Tilton Subbasin and Upper Cowlitz Coho Salmon and Fish Guidance Efficiency at Mayfield Dam and Cowlitz Falls Dam	UCS/TS
Survival, Productivity, and Age Composition	Smolt-to-Adult Return and Total Smolt-to-Adult Survival for Hatchery-Origin and Natural-Origin Coho Salmon	All
	Calculation of Separate Survival Estimates for the Segregated and Integrated Hatchery Programs for LCS Coho	All
	Productivity (Recruits/Spawner) of Hatchery-Origin and Natural-Origin Coho Salmon	All
	Juvenile Productivity (Smolts/Spawner)	All
	Adult Productivity (Adult Recruits/Parental Spawner)	All
	Consolidate Age Composition of Hatchery-Origin and Natural-Origin Coho Salmon into Single Database for Analysis and Reporting	All
Spawning in Nature	Estimates of Coho Salmon Successfully Reproducing in Nature	All
	Estimates of Coho Spawning in the Lower Cowlitz River, Including Strays from the Tilton and Upper Cowlitz Subbasins	All
	Estimate HOR Coho Salmon that Stray to Other Spawning locations (outside the Cowlitz Basin)	Hatchery
Hatchery Practices	Calculation of Separate Survival Estimates for the Segregated and Integrated Hatchery Programs for LCS Coho	All
Proportionate Natural Influence	Consider Hatchery Influence on Cowlitz Basin Coho Salmon Populations	All
	Consider Data Necessary to Make Informed Management Decisions with Natural Coho Salmon Spawning in the Mainstem Lower Cowlitz Subbasin and its Tributaries (to Decrease pHOS)	LCS
Pathology	Effects of <i>Ceratonova shasta</i> on Coho Salmon	TS

Topic/Theme	Summary of Data Gap/Potential Future Monitoring Need	Affected Populations ¹
Harvest	Consolidate Harvest Estimates of Hatchery-Origin and Natural-Origin Coho Salmon in the Pacific Ocean, Columbia River, Lower Cowlitz River, Tilton Subbasin, and Upper Cowlitz Subbasin into a Single Database for Reporting and Analysis	All

¹ LCS = Lower Cowlitz Subbasin; TS = Tilton Subbasin; UCS = Upper Cowlitz Subbasin

Table C-4: Data Gaps and Potential Future Monitoring Needs for Winter Steelhead

Topic/Theme	Summary of Data Gap/Potential Future Monitoring Need	Affected Populations ¹
Data Collection	Summarize Data and Assumptions for Winter Steelhead into a Single Shared Database for Analysis and Reporting	All
	Estimates of Total Run Size for Hatchery-Origin and Natural-Origin Winter Steelhead	All
	Adult Winter Steelhead vs. Jacks returning to the Basin	All
	Incorporate Data into Consolidated Database Characterizing Age Structure and Sexes	All
	Characterize Metrics for Natural-Origin Survival, Productivity, and Age Composition	All
	Steelhead Used for Broodstock and Sampled for Scales for Age Estimates	All
Stock Identification	Distinguishing Smolts Produced Naturally in the Lower Cowlitz Subbasin from those Produced Upstream of Mayfield Dam	All
Smolt Monitoring	Monitoring and Estimating Abundance of Smolts Leaving the Cowlitz River	All
	Understanding Winter Steelhead Production from the Lower Cowlitz Subbasin	LCS
	Understanding Winter Steelhead Production from the Upper Cowlitz Subbasin	UCS
	Understanding Winter Steelhead Production from the Tilton Subbasin	TS
	Natural Mortality of Outmigrating Juveniles	All
	Monitor Dam Passage Survival for Tilton Subbasin Winter Steelhead and Fish Guidance Efficiency at Mayfield Dam	TS/TS
Survival, Productivity, and Age Composition	Smolt-to-Adult Return and Total Smolt-to-Adult Survival for Hatchery-Origin and Natural-Origin Fall Chinook Salmon	All
	Productivity (Recruits/Spawner) of Hatchery-Origin and Natural-Origin Fall Winter Steelhead	All

Topic/Theme	Summary of Data Gap/Potential Future Monitoring Need	Affected Populations ¹
	Juvenile Productivity (Smolts/Spawner)	All
	Adult Productivity (Adult Recruits/Parental Spawner)	All
	Consolidate Age Composition of Hatchery-Origin and Natural-Origin Winter Steelhead into Single Database for Analysis and Reporting	All
	Age Composition Of Adult Steelhead Being Transported Upstream of Mayfield Dam	TS/TS
Spawning in Nature	Estimates of Winter Steelhead Successfully Reproducing in Nature	All
	Locations of Spawning Areas in the Upper Cowlitz, and Cispus Rivers and their Accessible Tributaries	UCS; TS
	Estimates of Natural Steelhead Spawning Abundance and Pre-spawn Mortality	All
	Lack of Estimates of Steelhead Spawners by Subbasin in the Upper Cowlitz Subbasin	All
	Spawning Surveys to Account for Other Losses (e.g., Fallback, Predation, and Pre-Spawn Mortality)	All
	Effects on Steelhead Adult NOR Abundance from Adult Returns Spawning out of Location	All
Hatchery Practices	Hatchery Data for Winter Steelhead – Total Eyed Eggs, Fertility, and Scale Information, Sex Ratio, Rate of Precocious Maturation for HORs Incorporated into Single Analysis and Reporting Database	All
Proportionate Natural Influence	Estimates of pHOS and PNI for Winter Steelhead	All
Harvest	Estimates of Population-specific Harvest Rates for Hatchery-Origin Steelhead Fisheries in the Pacific Ocean, Columbia River, Lower Cowlitz Subbasin, Upper Cowlitz Subbasin, and Tilton Subbasin	All

Topic/Theme	Summary of Data Gap/Potential Future Monitoring Need	Affected Populations ¹
	Population-Specific Estimates of Indirect Mortality Rates for Natural-Origin Steelhead Fisheries in The Pacific Ocean, Columbia River, Lower Cowlitz Subbasin, Upper Cowlitz Subbasin, and Tilton Subbasin	All

¹ LCS = Lower Cowlitz Subbasin; TS = Tilton Subbasin; UCS = Upper Cowlitz Subbasin

Table C-5: Data Gaps and Potential Future Monitoring Needs for Cutthroat Trout, Chum Salmon, and M&E

Species/Topic	Summary of Data Gap/Potential Future Monitoring Need	Affected Populations¹
Cutthroat Trout	Summarize Data and Assumptions for Cutthroat Trout into a Single Shared Database for Analysis and Reporting	UCS; TS
	Estimate Popularity of the Cowlitz Basin Cutthroat Trout Hatchery Program	All
	Consider Studies to Improve the Efficacy and Management of the Cutthroat Trout Hatchery Program	All
Chum Salmon	Summarize Data and Assumptions for Chum Salmon into a Single Shared Database for Analysis and Reporting	
M&E	Estimate Abundance and Productivity Of Salmonid Populations in Tributaries	All
	Data Inputs for One- and Two-Stage Life Cycle Models	All
	Big Tables as “Data Warehouse”	All

¹ TS = Tilton Subbasin; UCS = Upper Cowlitz Subbasin

APPENDIX D:
WHITE PAPER - FALL CHINOOK SALMON
BROODSTOCK COLLECTION

Tacoma Power Fisheries and Hatchery Management Plan

Interim Plan for Lower Cowlitz River Fall Chinook Salmon Broodstock Collection

Product of April 30, 2020 Unresolved Interim Plan Workshop

Prepared by R2 Resource Consultants, Inc.

Purpose

The purpose of this white paper is to assist in the development of the Interim Plan to be utilized in 2021 for the collection of broodstock in support of the Cowlitz River Fall Chinook Salmon Hatchery Program by characterizing the issue for which conflict has arisen as well as providing different perspectives surrounding and solutions to the conflict.

Background

The Willamette/Lower Columbia Technical Recovery Team (2004) identified two separate populations of Cowlitz River fall Chinook Salmon, one population in the lower Cowlitz River (Lower Cowlitz Subbasin) and one in the river upstream of Mayfield Dam, encompassing the Cispus, upper Cowlitz, and Tilton river basins (Upper Cowlitz Subbasin). Currently, there is no hatchery program aimed at recovering the Upper Cowlitz Subbasin population. Fall Chinook Salmon hatchery programs consist of a Lower Cowlitz Subbasin Segregated Hatchery Program and a Lower Cowlitz Subbasin Integrated Hatchery Program utilizing natural-origin salmon captured from the lower Cowlitz River. Recovery for the Upper Cowlitz Subbasin fall Chinook Salmon population is currently focused on the Tilton River, and it is proposed that this will be accomplished over time by converting the current Lower Cowlitz Subbasin Segregated and Integrated hatchery programs into a single Upper Cowlitz Subbasin Integrated Hatchery Program.

With the beginning of the Lower Cowlitz Subbasin Integrated Fall Chinook Salmon Hatchery Program in 2013, hatchery-origin broodstock has largely been collected from those salmon returning to the trap ("Hatchery Separator") at the Barrier Dam Adult Facility. The program had a low integration rate, with a large majority of the smolts coming from HORxHOR crosses. Over the past three years (2017-2019), the hatchery program has experienced returns that posed challenges for obtaining sufficient numbers of natural-origin return, and hatchery-origin return, broodstock. These challenges were largely due to poor hatchery-origin adult abundance but were also caused by lower-than-anticipated capture rates of angled natural-origin broodstock. In addition, proportions of hatchery-origin and natural-origin fish used in broodstock collection during this time period have not met goals for recovering population metrics, including the proportion of natural-origin salmon in the broodstock (pNOB) and the proportionate natural influence (PNI).

While most of the hatchery-origin broodstock has been collected from hatchery-origin returns to the hatchery, Washington Department of Fish and Wildlife (WDFW) has been supplementing the numbers with natural-origin adults captured off the spawning grounds in the lower Cowlitz River. The protocols used to capture natural-origin salmon in the lower river targeted adult males. As a result, most of the adults captured and used for broodstock were males (estimated mean of 87%). Relying so heavily on males for the natural-origin contribution is not well understood (personal communication, R. Waples, J. Hard, and P. Moran, NOAA Fisheries) and needs to be addressed by the Monitoring & Evaluation (M&E) Subgroup as part of the Annual Program Review (APR) process. This has been the strategy for broodstock collection until recent years. In 2018 and 2019, low hatchery-origin fall Chinook Salmon

abundance occurred and required the use of natural-origin returns to the Hatchery Separator to satisfy broodstock requirements on an emergency basis.

At this time, there is no adequate mechanism by which to identify the population of origin for natural-origin fall Chinook Salmon that return to the Hatchery Separator; these salmon could be headed to the Tilton River for spawning or could be from the Lower Cowlitz Subbasin population, or possibly even strays from nearby river. Given that the recent number of returning natural-origin adults to the lower Cowlitz River has been at or above delisting abundance level, and the focus is on increasing overall abundance in the Tilton River, all natural-origin fish that returned to the Hatchery Separator since 2017 and were not required for broodstock have been trucked and released in the Tilton River to enhance natural reproduction there.

Define the Conflict

The parties do not agree on the appropriate strategy for collecting natural-origin broodstock for the Lower Cowlitz Subbasin Integrated Fall Chinook Salmon Hatchery Program during the interim period while a Transition Plan for fall Chinook Salmon is developed, and concern has been raised that moving to a new broodstock strategy may be risky without first developing and implementing a marking strategy to better inform broodstock and outplanting decisions.

Potential Approaches

Three potential approaches to the collection of natural-origin broodstock have been identified that could be implemented in 2021: (1) follow the 2011 FHMP Existing Strategy, (2) use an Aggregated Strategy collecting natural-origin fish from both the lower river and the Hatchery Separator, or (3) use a Separator Only Strategy collecting all natural-origin fish from the Hatchery Separator. Each of these programs is described briefly below.

1. Following the Existing Strategy, all natural-origin fish for the Lower Cowlitz Subbasin Integrated Fall Chinook Salmon Hatchery Program would be collected from the lower Cowlitz River. All natural-origin returns to the Hatchery Separator would go to the Tilton River.
 - a. The natural-origin component of hatchery broodstock would be collected from the lower Cowlitz River only. This would include capturing adults from multiple locations across the spawning grounds and holding areas throughout the lower Cowlitz River via angling, netting, and/or snagging. If the same protocol for capture is used, it would likely continue to result in a higher proportion of natural-origin males caught as compared to females. This protocol targets males as they can be released after sperm collection, whereas removing females for broodstock would be a final action and would reduce the production potential of the Lower Cowlitz Subbasin population.
 - b. This approach would maintain the current approach with two separate programs for the Lower Cowlitz Subbasin, one integrated program and one segregated program.
2. The Aggregated Strategy would combine two collection methods. Natural-origin fall Chinook Salmon returns would be collected both in the lower Cowlitz River and from the Hatchery Separator. Any natural-origin returns to the Hatchery Separator in excess of broodstock needs would be transported to the Tilton River.
 - a. A portion of the natural-origin broodstock would be captured off the spawning grounds from the lower river, as described in 1 above.

- b. In addition, some number of natural-origin broodstock would be collected from salmon that return to the Barrier Dam Adult Facility.
 - c. Due to the mixing of unknown numbers of Tilton River and lower Cowlitz River returning salmon, this approach would likely result in a single integrated program for the entire Upper/Lower Cowlitz Subbasin Integrated Fall Chinook Salmon Hatchery Program.
- 3. The Separator Only Strategy would collect all natural-origin broodstock from the Hatchery Separator only. This approach would result in a reduced number and proportion of total adult returns being outplanted in the Tilton River.
 - a. All natural-origin broodstock would be collected at the Hatchery Separator.
 - b. This approach would initiate a separate integrated hatchery program for the Tilton River, and a segregated program may also need to be continued to meet overall production targets.

Differences in Perspectives

1. Existing Strategy

The Existing Strategy was adopted in the 2011 FHMP has been used by fish managers to support the current Lower Cowlitz Subbasin Integrated Fall Chinook Salmon Hatchery Program by mixing hatchery-origin adults with natural-origin adults that are spawning in the lower Cowlitz River. Continued implementation of the Existing Strategy would provide consistent genetics for this hatchery program through 2021. In the original hatchery program, natural-origin salmon from the Lower Cowlitz River were spawned with hatchery-origin salmon; some of the natural-origin salmon currently spawning in the lower Cowlitz River are offspring from that program. Thus, this strategy allows for some of those natural-origin genes to be maintained in the integrated program.

However, there is some uncertainty that the salmon captured in the lower Cowlitz River would have spawned there if left in the river; it is possible at least some of these salmon are intercepted en-route to the Barrier Dam Adult Facility. Further, using predominantly males for the natural-origin component of broodstock is not an accepted hatchery practice and could have potential genetic consequences associated with sex-linked traits if natural-origin males are overrepresented and females are underrepresented in the hatchery population. It is also relevant that a low number of natural-origin salmon have been collected and the mean pNOB for the Integrated Hatchery Program has been very low.

Based on recent return years at the Hatchery Separator and natural-origin capture numbers, it is likely that using the Existing Strategy will result in pNOB for the Lower Cowlitz River Integrated Fall Chinook Salmon Hatchery Program remaining well below that desired to reach recovery goals. The number of broodstock captured off the spawning grounds potentially could be increased with additional effort, but also would increase impact on the natural-spawning lower Cowlitz River population due to uncertainty of the disposition of captured salmon, high egg loss and prespawn mortality rate of collected salmon, and general harassment of all natural-origin salmon on the spawning grounds. Ultimately, the Cowlitz River recovery plans call for moving forward with two distinct fall Chinook Salmon populations, one above Mayfield Dam and one in the Lower Cowlitz Subbasin.

2. Aggregated Strategy

The Aggregated Strategy represents a step toward managing these populations together during the interim period while the Cowlitz River Fisheries Technical Committee (FTC) works to develop and implement plans to fill data gaps. WDFW has been implementing emergency measures that have resulted in the ongoing Lower Cowlitz Subbasin Fall Chinook Salmon Integrated Hatchery Program being aggregated and stated their willingness to maintain this for one more year. This Aggregated Strategy would allow for increased pNOB for the current program and reduce concerns about potential genetic effects on the hatchery population that may be associated with a male-dominated natural-origin component in the Existing Strategy.

There exists uncertainty about the potential effects this approach would have on recovery genetics due to unconfirmed origin of natural-origin salmon at the Hatchery Separator. Until a marking identification strategy is implemented and some data are available to identify Upper Cowlitz Subbasin vs. Lower Cowlitz Subbasin populations, fish managers cannot be confident that the Upper Cowlitz Subbasin program is moving in the direction it needs to go. Even with this uncertainty, WDFW is willing to consider the use of an aggregated broodstock approach as long as there is progress in planning how to differentiate Upper Cowlitz Subbasin and Lower Cowlitz Subbasin stocks and collect data on the abundance of both spawners and naturally produced juveniles.

Concern has been expressed that collecting more natural-origin salmon from the Hatchery Separator for broodstock will result in mixing of upper river and lower river genes because all salmon that return to the Hatchery Separator are assumed to have come from the Tilton River. If this assumption is correct, then collecting broodstock from the lower Cowlitz River for supplementing the Tilton River population would be counterproductive to moving toward recovery goals that include two distinct populations. However, mixing of genes has already occurred for a significant period of time due to Lower Cowlitz Subbasin hatchery-origin fall Chinook Salmon being placed in the Tilton River to spawn with the natural-origin salmon.

3. Separator Only Strategy

Assuming that all, or almost all, salmon arriving at the Hatchery Separator are returning from the Upper Cowlitz Subbasin, collection of fall Chinook Salmon broodstock from the Hatchery Separator would advance the hatchery program toward an Upper Cowlitz Subbasin Integrated Hatchery Program to support recovery in the Tilton River. This approach would allow the program to meet pNOB goals, would improve PNI, and would support enhanced Local Adaptation in both the Tilton River and lower Cowlitz River.

However, because of uncertainty around the origin of natural-origin fall Chinook Salmon that return to the Hatchery Separator, this approach would have risk that some genes from the Lower Cowlitz Subbasin are mixed with those from the Tilton River population. This impact is not currently measurable, but it should also be understood that some level of straying (5-10%) and subsequent gene sharing is normal and healthy for natural salmon populations.

Summary of Root Causes Differences

The different perspectives presented for the three possible approaches for broodstock collection center around concerns of:

- 1) The current program not meeting the recovery broodstock goals for integrated hatchery population;

- 2) The uncertainty around natural-origin fall Chinook Salmon population of origin;
- 3) Concerns about the potential inability to meet reduced pHOS limits in the Lower Cowlitz Subbasin fall Chinook Salmon population once the hatchery program has transitioned to an Upper Cowlitz Subbasin integrated program;
- 4) The impacts associated with collection of broodstock off the lower Cowlitz River spawning grounds.

Under the Existing Strategy, the Cowlitz Salmon Hatchery has not met natural-origin broodstock goals and, in some recent years, also has not met hatchery-origin broodstock needs. Also, the capture and use of predominantly males for natural-origin broodstock is not consistent with current standards of hatchery programs used for recovery and poses some risk to the natural-spawning population in the Lower Cowlitz Subbasin. These concerns indicate deficiencies in the current hatchery program and the need to consider a new strategy for broodstock collection and management in 2021 in order to improve hatchery performance.

Plan for Resolution

Within the first year following the FHMP submittal, Tacoma Power and the FTC will develop a Transition Plan that identifies data gaps required to be filled prior to transition (e.g., marking strategy, abundance). Following completion of the Transition Plan and initiation of strategies to fill critical data gaps, the hatchery will begin the use of salmon caught at the Hatchery Separator as the primary source for broodstock unless other circumstances warrant additional consideration by the FTC. In addition, the FTC has developed this white paper to describe various perspectives to be appended to the FHMP for use during development of the Transition Plan.

Agreed-Upon Interim Plan

The agreed-upon interim plan is to use the APR process annually to determine how best to collect broodstock based on available preseason information, until the Transition Plan is developed and successfully implemented (as agreed upon at the April 7, 2020 FTC Unresolved Interim Plan Workshop).

References

Willamette/Lower Columbia Technical Recovery Team. 2004. Status evaluation of salmon and steelhead populations in the Willamette and Lower Columbia river basins. Northwest Fisheries Science Center, Seattle.