

Program Transition Plan Template

Program(s): Spring Chinook Salmon

Affected Recovery Population(s) and Recovery Designation(s):

Population Name	Population Recovery Designation
Upper Cowlitz River	Primary
Cispus River	Primary
Tilton River	Stabilizing

Synopsis of how this Transition Plan is expected to change the current hatchery program and advance population(s) to the next Recovery Phase as characterized in 2020 FHMP:

Spring Chinook Recovery during this FHMP period will continue to focus on the Upper Cowlitz/Cispus populations. Segregated hatchery production will be maintained with an annual juvenile release goal of ~1.8 Million, based on bioprogramming. The program will be a combination of yearling and sub-yearling releases. The yearling program will be maximized based on facility space and water availability and sub-yearlings will be used to make up the difference to achieve the program goal. Assessment of SAR by release size will continue to be evaluated. The Bioprogramming Plan will assess if additional yearling rearing capacity can be realized. Program improvement will increase availability of adults to recolonize the upper Cowlitz/Cispus watersheds and build abundance, while maintaining harvest opportunity.

The current segregated hatchery program will continue while conducting a life cycle modeling/ population viability analysis to establish key biological reference points for the Upper Cowlitz/Cispus spring Chinook population (i.e, minimum seeding targets). Once this information is available (expected in 2022), it will be used in conjunction with estimates of collection efficiency at CFFF to determine if it is appropriate to begin implementation of an integrated program using one of the following options: 1) a single integrated program for the entire production, or 2) a “stepping stone” approach utilizing a smaller highly integrated program alongside a segregated program to meet production goals.

During the period of the 2020 FHMP a plan to create an integrated spring chinook program will be developed. The plan will capture details such as NOR/HOR broodstock needs and availability, pNOB targets, return timing curves, broodstock mining rate maximums and targets, juvenile fish size and release date targets.

Recovery Phase(s) as Described in FHMP: Upper Cowlitz/Cispus populations - Recolonization; Tilton River population – N/A (extirpated)

Goal of new program by recovery phase (i.e. conservation/harvest, etc):

Recovery Phase	Goal of program	Thresholds/Triggers/Decision Rules required to transition from one phase to next
Preservation	Conservation (promote recovery) and harvest	Natural origin population at risk of extirpation

		<p><i>Not applicable – as populations are already past this phase</i></p> <ul style="list-style-type: none"> • 5 yr geomean total abundance (when counting NOR adults plus HOR adults up to the number which would cause pHOS to equal the pHOS goal for Local Adaptation) is LESS than the quasi-extinction threshold (QET to be determined during Population Phase Assessment). • Vast majority/all of historical habitat is unusable/heavily impacted/inaccessible currently (e.g., blocked by dams with no passage)
Recolonization	Conservation (promote recovery) and harvest	<p>Natural origin population at low abundance; habitat underutilized</p> <p>Assuming Upper Cowlitz/Cispus populations are in this phase now. Consider beginning an Integrated program once adult returns are self-sustaining and there is an anticipated conservation benefit.</p> <p>Tilton population is currently extirpated, recovery efforts during this FHMP period are focused on the Upper Cowlitz/Cispus population.</p> <ul style="list-style-type: none"> • 5 yr geomean total abundance (when counting NOR adults plus HOR adults up to the number which would cause pHOS to equal the pHOS goal for Local Adaptation) is MORE than quasi-extinction threshold but LESS than the number needed to meet the interim viability goal (NOAA VSP criteria or alternative). • Interim viability goal can be expressed as seeding a percentage (e.g., 50%) of the freshwater habitat, and can be estimated by stock recruit analysis (e.g., estimate spawner abundance required to produce 50% of R_{max}). • Enough historical habitat is currently accessible (including by trap and haul) for maintenance of an equilibrium population size greater than QET (to be determined during Population Phase Assessment).
Local Adaptation	Conservation (promote recovery) and harvest	<p>Natural origin population nearing full-seeding of available habitat</p> <p>Assuming populations have not currently achieved this phase. Once populations have reached this phase:</p>

		<ul style="list-style-type: none"> Develop assessment criteria for trigger(s) during next 1 year <ul style="list-style-type: none"> Such as integrating R_{max}, SAR and/or adult to adult productivity into phase triggers 		
Full Recovery	Maintain Recovery and provide Harvest	<p>Natural origin population is both above full-seeding of available habitat AND meeting its healthy and harvestable recovery goals.</p> <p>Assuming current populations are not yet in this phase. Revisit criteria if population assessment confirms populations are currently in Local Adaptation phase.</p> <ul style="list-style-type: none"> 5 yr geomean of spawner NOR abundance (not counting HORs) is MORE than minimum interim viability objective when only counting NOR spawners, and is also MORE than its recovery goal. 		
<p>Current Program: This describes the spring Chinook Salmon program prior to interim management implemented in 2021.</p>				
Program Name:		Upper Cowlitz Subbasin Spring Chinook Salmon		
Program Type:		Segregated		
Recovery Phase:		Recolonization		
Goal of Program(s):		Conservation/Harvest		
<p align="center">Adult Broodstock Collection</p>				
Broodstock Source		Cowlitz HOR adults		
Broodstock Collection location/methods		HOR returns to separator		
Integration Rate ¹		Segregated: 0.0		
Collection timing curves:				
Secondary sources/plans for lack of adults		None established		
<p align="center">Adult Transportation & Disposition (HORs)</p>				
<i>Target</i>	<i>Rank</i>	<i>Quantity (range)</i>	<i>Location</i>	<i>Dates</i>

¹ fixed, sliding scale

Upper Cowlitz River	1	25% AHN	Franklin Bridge	Mar-Oct
Cispus River	1	25% AHN	Tom Music Bridge	Mar-Oct
Lake Scanewa	1	50% AHN	LCPUD Boat Launch	Mar-Oct
Surplus -	2	Above transport and hatchery needs	Local/Statewide/Tribal food banks Other	Mar-Oct
Nutrient Enhancement	3	Spawned carcasses/non-food grade quality surplus above hatchery and transport needs	Upper Basin	Sept-Feb
NORs - 100% of NOR's sent to Scanewa, conditions permitting.				
Juvenile Release(s)				
Release Groups 1-3		3 grouped releases – volitional followed by force out.		
Quantity (range)		1.738 Million segregated <ul style="list-style-type: none"> Friends of Cowlitz – 55k Pending new site agreement. Used through 2018. Group 1- 500k @ 16fpp in November Group 2 – 800k @ 8fpp in March Group 3 – 438k @ 5fpp in March 		
Release Age/size		Released at 16fpp subyearlings, 8 fpp yearlings and 5 fpp yearlings		
Release Location/Timing		Cowlitz Salmon Hatchery – Nov and March Rearing in outdoor raceways and released through a strategy where fish are volitionally released for 5 days after which they are forced out: <ul style="list-style-type: none"> 16fpp group released in November 8fpp group released in March 5fpp group released in March 		
Marking/Tagging strategy ²		Marking in June at (60 fpp) <ul style="list-style-type: none"> Group 1 – 400k AD Only and 100k AD+CWT Group 2 – 700k AD Only and 100k AD+CWT Group 3 – 338k AD Only and 100k AD+CWT 		
Fish Management needs		Adipose clip required to allow harvest in mark-selective fisheries		

² Identify how do these strategies address fish Management/evaluation, monitoring data, and adaptive management trigger points.

	CWT allows for evaluation of stock composition to fisheries CWT allows for evaluation/verification of age composition along with scale sampling
Evaluation Needs	Adipose clip allows for evaluation of pHOS/pHOB and PNI. CWT allows for evaluation of stock composition on spawning grounds CWT accurate evaluation of age composition
Summary of Hatchery Configuration/Infrastructure: <ul style="list-style-type: none"> • Adult collection for this program occurs at the Cowlitz Barrier Dam Separator. Broodstock is held at the Cowlitz Salmon Hatchery. • Spawning and egg incubation occur at the Cowlitz Salmon Hatchery. • A portion of the program is sometimes acclimated prior to release in net pens located in the lower Cowlitz in conjunction with Friends of the Cowlitz. • Incubation: Heath trays separated by female for ELISA culling – Cull High and Moderate ELISA's. • Early rearing: Indoor troughs Rearing: Outdoor raceways	
Harvest Management Strategy³	
Upper river opportunity/harvest	Upper Cowlitz Subbasin: Mark Selective Harvest rate ranging from 3% to 22% Seasons/bag limits are set pre-season via NOF based on forecasted returns
Lower river opportunity/harvest	Lower Cowlitz Subbasin: Mark Selective Harvest rate ranging from 39% to 84% Seasons/bag limits are set pre-season via NOF based on forecasted returns and managed in-season based on separator returns.
Ocean/ Columbia R. opportunity/harvest	Ocean: non-mark-selective Columbia R. – mark-selective Seasons/bag limits are set pre-season via NOF based on forecasted returns
Program Performance Metrics	
Proportionate Natural Influence (PNI)	Target: Recent Performance:
pHOS level	Target: NA – Recolonization phase Recent Performance: Mean = 58.4% (0%-98.3%)
pNOB levels	Target: NA – Recolonization phase Recent Performance: 0.0 – Recolonization phase

³ %harvest or # harvest x transported; fishery type (e.g., adult/jacks?; HOR/NOR, selective/non-selective, etc.)

Brood stock mining rate	Target: 0% Recent Performance: 0%
Overall Performance Relative to Goals ⁴	pHOS goals are not applicable during Recolonization phase PNI - program is in the Recolonization phase and is using a segregated program,
<p>Current Monitoring Program:</p> <p>In the lower Cowlitz River total Chinook redd counts are made by helicopter surveys every other week through the season as conditions allow. The estimate of total spawners is generated by peak redd count expansion. The initial survey flight is considered to be indicative of spring Chinook spawning in the lower Cowlitz. Weekly carcass surveys employing carcass tagging by boat were implemented in 2021. These methods are used to generate pHOS estimates and generate age and stock composition as well as determine carcass recovery rates to modify the total spawner estimate generated by the aerial surveys.</p> <p>HOR broodstock are sampled and all fish with CWT are retained so the data can be recovered to further inform cohort (according to release size and timing) reconstruction approaches and for age validation purposes as necessary.</p> <p>A spot creel operates by interviewing anglers in the lower Cowlitz River to collect in-season biological data. The ratio of the number of HOR fish kept to the number of NOR fish reported as released can then be compared to catch record card harvest reported to estimate the total number of NOR spring Chinook released. Further, an assumed mortality rate can be applied to estimate fishery mortality in the future.</p>	

⁴ outline the main reasons why a transition is needed

Proposed Program:

Proposed Pathway #1					
Program Name:			Upper Cowlitz Spring Chinook Salmon		
Program Type:			Segregated		
Recovery Phase:			Recolonization		
Goal of Program:			Conservation/Harvest		
Timing for Transition ⁵			Beginning in 2022		
Adult Broodstock Collection					
Broodstock Source			Cowlitz HOR adults		
Broodstock Collection location/methods			HOR returns to separator		
Integration Rate ⁶			Segregated: 0.0		
Priority		Collection Strategy	pNOB goal	Brood Source	Spawning Strategy
1	Low HOR	a. at separator	0%	a. HORs at separator; b. out of basin options	a. HOR x HOR; b. consider out of basin brood supplementation options if we are projected to not make yearling brood for 3 consecutive years (seek consultation with NOAA)

⁵ immediate, stepping stone, specific timeframe/ milestone targets

⁶ fixed, sliding scale

2	Normal HOR	collect at separator	0%	HOR at separator	a. HOR x HOR	

Definitions: - The following are interim thresholds for implementing broodstock collection as described in the table above (based on most recent 9 years of data since mass marking collected at separator).

Normal HOR (Upper Cowlitz) – >1,501

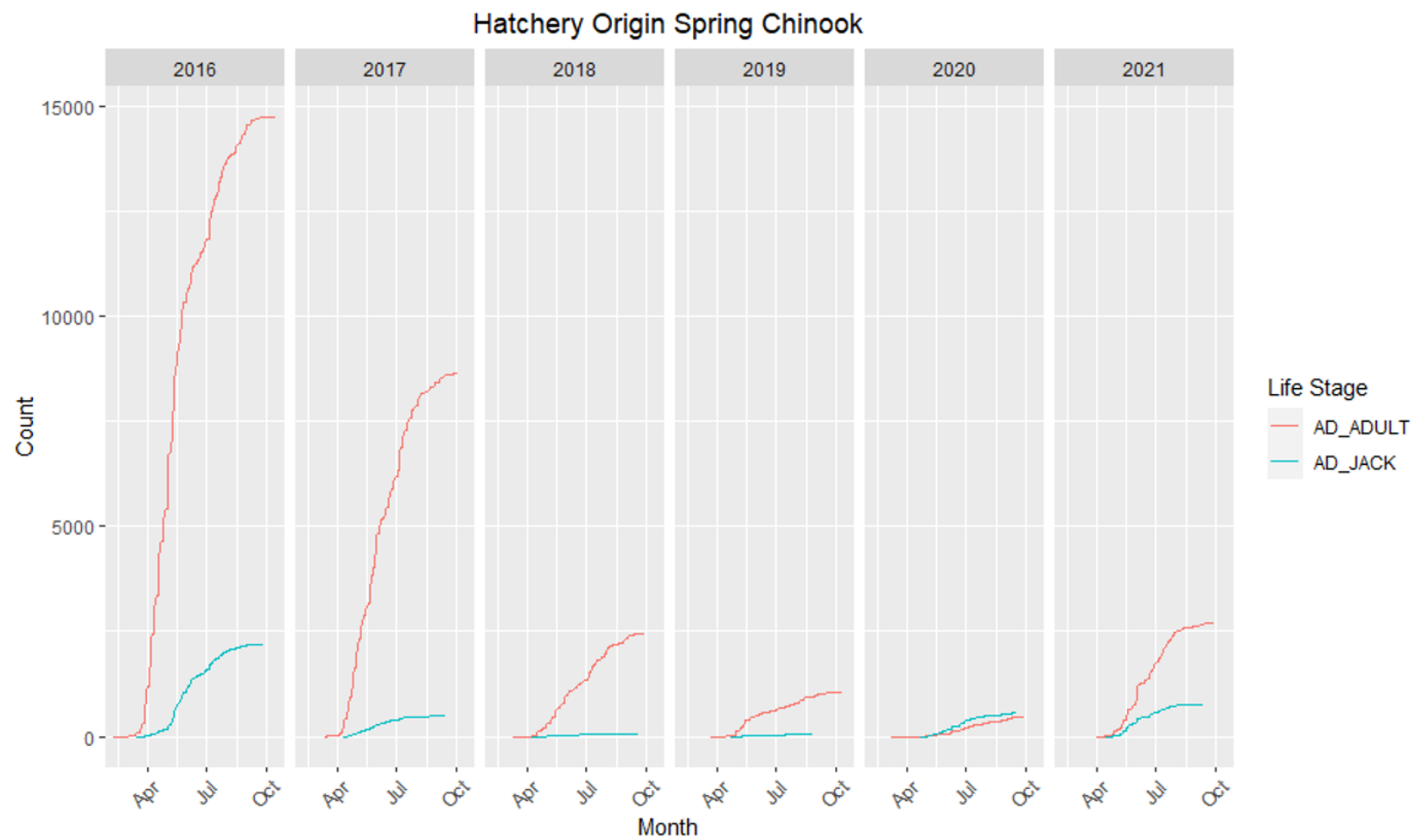
Low HOR (Upper Cowlitz) - <1,500 including brood

Normal NOR (Upper Cowlitz) – >201

Low NOR (Upper Cowlitz) – <200 including brood

Minimum Integration Target – 0%

Collection timing curves:



Spring Chinook

Recent, 5 year average return per program by week and respective broodstock collection goals. Example only, actual collection goals will be set via Annual Operating Plan.

Table reflects HOR and NOR collection/return *example*

5 year average (2017-2021)

		Segregated	
		Upper Cowlitz	
		HOR (AD)	
Week	Week	Return	Brood
Number	Ending	Average	Goal
Week 10	March 12	0	
Week 11	March 19	3	
Week 12	March 26	3	
Week 13	April 2	3	
Week 14	April 9	14	30
Week 15	April 16	91	53
Week 16	April 23	120	88
Week 17	April 30	195	87
Week 18	May 7	194	123
Week 19	May 14	227	147
Week 20	May 21	146	110
Week 21	May 28	229	81
Week 22	June 4	318	94
Week 23	June 11	107	58
Week 24	June 18	102	56
Week 25	June 25	153	50
Week 26	July 2	132	59
Week 27	July 9	241	92
Week 28	July 16	164	70

Week 29	July 23	117	51
Week 30	July 30	116	42
Week 31	August 6	98	61
Week 32	August 13	59	
Week 33	August 20	36	
Week 34	August 27	38	
Week 35	September 3	61	
Week 36	September 10	55	
Week 37	September 17	27	
Week 38	September 24	16	
Week 39	October 1	6	
Week 40	October 8	1	
Week 41	October 15	0	
Totals		3070	1352
Total Return Size		3070	
Total Brood Collected		1352	
Brood %		100.0%	
Assumed Fecundity		3,750	
pNOB		n/a	
Mining Rate		n/a	
Demographic Replacement (RRS=0.75)		n/a	
Demographic Replacement (RRSHarv=0.5)		n/a	
Total Egg Take		2,275,325	
Total Release Goal		1,738,000	
Adult Transportation & Disposition			

<i>NOR</i>				
<i>Target</i>	<i>Rank</i>	<i>Quantity (range)</i>	<i>Location</i>	<i>Dates</i>
Lake Scanewa	1	100%	LCPUD Boat Launch	Before June 15, potentially modify above date or use temperature as cutoff to get as many NORs in Lake Scanewa as possible
Cowlitz/Cispus	2	50%/50%	Franklin Bridge/Tom Music Bridge	a) After June 15 to avoid high temperatures (18 degree C at facility); b) Do not release into drawdown or forecast spill event through Cowlitz Falls Dam (> 11KCFS)
Consider Use of Alternate Lake Scanewa Release Sites (if available/feasible)	3	100%	Fish Haul Road or Kayak takeout	After June 15 to avoid high temperatures (18 degree C at facility)
Note: there is currently no recommended angling threshold to change the recommendation to plant spring Chinook in Lake Scanewa unless a problem (angler encounters) becomes apparent. Rather, fish management strategies through emergency regulations will be used to manage this potential problem for now.				
<i>HOR</i>				
<i>Target</i>	<i>Rank</i>	<i>Quantity (range)</i>	<i>Location</i>	<i>Dates</i>
Upper Cowlitz River	1	25% AHN	Franklin Bridge	Mar-Oct
Cispus River	1	25% AHN	Tom Music Bridge	Mar-Oct
Lake Scanewa	1	50% AHN	LCPUD Boat Launch	Mar-Oct
Surplus	2	Above transport and hatchery needs, C&S, CWT Recovery	Local/Statewide/Tribal food banks Other	Mar-Oct

Nutrient Enhancement	3	Spawned carcasses (if allowed per fish hatchery fish health guidelines)/non-food grade quality surplus above hatchery and transport needs	Upper Basin	Mar-Oct	
Notes:					
Juvenile Releases					
Release Groups			2 to 3 release groups – volitional release followed by force out for yearling programs		
Quantity (range)			Up to 1.8 Million segregated <ul style="list-style-type: none"> Groups 1 and 2 – yearling hatchery groups at 5 – 13 fpp, backfilled with subyearling program released between March and May Group 3 – subyearling program 16 – 20 fpp Spring chinook SAR work completed by the M&E group to guide fpp and release dates for all groups 		

Release Age/size	Yearlings released between 5 – 12 fpp; and subyearlings released between 16 – 20 fpp		
Release Location/Timing	Cowlitz Salmon Hatchery/Mar-May		
Note: the yearling program will be maximized based on facility space and water availability. Subyearlings will be used to make up the difference to achieve the 1.8 million program goal.			
Marking/Tagging strategy ⁷	<ul style="list-style-type: none">○ NOR fish will remain unmarked, and a portion of each HOR release strategy will be marked with CWT for assessment purposes.○ PIT tagging of subsample of juveniles from out-migrating juveniles from Cowlitz Falls○ Revisit marking strategy from hatchery programs when integrated programs begin		
Summary of Hatchery Configuration/Infrastructure Modifications ⁸ : <ul style="list-style-type: none">• An alternative to redistribute a portion of the coho program to net pens will be considered as an alternative to maximize hatchery space available for the spring Chinook program during the bioprogramming review			
Harvest Management Strategy			
INTERIM			
	Abundance		
Area	Low	Normal	Above Normal
Tilton	For this FHMP period, transport of spring Chinook to the Upper Cowlitz/Cispus has been prioritized. There are currently no spring Chinook transported to the Tilton.	For this FHMP period, transport of spring Chinook to the Upper Cowlitz/Cispus has been prioritized. There are currently no spring Chinook transported to the Tilton	For this FHMP period, transport of spring Chinook to the Upper Cowlitz/Cispus has been prioritized. There are currently no spring Chinook transported to the Tilton

⁷ Identify how do these strategies address fish Management/evaluation, monitoring data, and adaptive management trigger points.

Upper Cowlitz/Cispus	<p>Currently, pre-season management based on overall spring Chinook forecast strength;</p> <p>Fishery on excess HORs transported to upper Cowlitz and Cispus ABOVE those needed for Cowlitz hatchery program.</p> <p>Restricted Mark-Selective fishery (reduced bag limit or full closure); In-season management based on actual separator returns of HOR.</p>	<p>Currently, pre-season management based on overall spring Chinook forecast strength;</p> <p>Fishery on excess HORs transported to upper Cowlitz and Cispus ABOVE those needed used for Cowlitz hatchery program.</p> <p>Full Season Mark-Selective fishery (hatchery fish with 2 adults) In-season management based on actual separator returns of HOR and NOR.</p>	<p>Currently, pre-season management based on overall spring Chinook forecast strength;</p> <p>Fishery on excess HORs transported to upper Cowlitz and Cispus ABOVE those needed used for Cowlitz hatchery program.</p> <p>Full Season Mark-Selective fishery (hatchery fish with 2 adults); Potential for increased bag limits In-season management based on actual separator returns of HOR and NOR.</p>
Lower Cowlitz	<p>Currently, pre-season management based on overall spring Chinook forecast strength; Fishery on excess HORs ABOVE those needed for Cowlitz hatchery program.</p> <p>Restricted Mark-Selective fishery (reduced bag limit or full closure); In-season management based on actual separator returns of HOR.</p>	<p>Currently, pre-season management based on overall spring Chinook forecast strength; Fishery on excess HORs ABOVE those needed for Cowlitz hatchery program.</p> <p>Full Season Mark-Selective fishery (hatchery fish with 2 adults). In-season management based on actual separator returns of HOR.</p>	<p>Currently, pre-season management based on overall spring Chinook forecast strength; Fishery on excess HORs ABOVE those needed for Cowlitz hatchery program.</p> <p>Full Season Mark-Selective fishery (hatchery fish with 2 adults). In-season management based on actual separator returns of HOR.</p>

Ocean/Columbia River	<p>Columbia River: Mark-Selective; Ocean commercial and sport fishery is considered negligible.</p> <p>Cowlitz stock is part of LCR spring Chinook aggregate for Columbia River Fishery Management. Seasons considered via North of Falcon;</p>	<p>Columbia River: Mark-Selective; Ocean commercial and sport fishery is considered negligible.</p> <p>Cowlitz stock is part of LCR spring Chinook aggregate for Columbia River Fishery Management. Seasons considered via North of Falcon;</p>	<p>Columbia River: Mark-Selective; Ocean commercial and sport fishery is considered negligible.</p> <p>Cowlitz stock is part of LCR spring Chinook aggregate for Columbia River Fishery Management. Seasons considered via North of Falcon;</p>	
LONG TERM				
	Abundance			
Area	Low	Normal	Above Normal	
Upper Cowlitz (Tilton)	<p>For this FHMP period, transport of spring Chinook to the Upper Cowlitz/Cispus has been prioritized. There are currently no spring Chinook transported to the Tilton</p> <p>Long-term- spring-chinook transport to the Tilton will be re-evaluated.</p>	<p>For this FHMP period, transport of spring Chinook to the Upper Cowlitz/Cispus has been prioritized. There are currently no spring Chinook transported to the Tilton</p> <p>Long-term- spring-chinook transport to the Tilton will be re-evaluated.</p>	<p>For this FHMP period, transport of spring Chinook to the Upper Cowlitz/Cispus has been prioritized. There are currently no spring Chinook transported to the Tilton</p> <p>Long-term- spring-chinook transport to the Tilton will be re-evaluated.</p>	

Upper Cowlitz/Cispus	<p>Utilize Cowlitz specific forecasts for pre-season management; Fishery on excess HORs transported to upper Cowlitz and Cispus ABOVE those needed to replace NORs used for broodstock (hatchery equivalents)</p> <p>Once seeding/escapement goals are established: Restricted Mark-Selective fishery (reduced bag limit or full closure); In-season management based on actual separator returns of HOR/NOR.</p>	<p>Utilize Cowlitz specific forecasts for pre-season management; Fishery on excess HORs transported to upper Cowlitz and Cispus ABOVE those needed to replace NORs used for broodstock (hatchery equivalents);</p> <p>Once seeding/escapement goals are established and met: Potential for NOR harvest if above escapement goals Full Season Non-Mark-Selective fishery (HOR/NOR bag limits TBD); In-season management based on actual separator returns of HOR/NOR.</p>	<p>Utilize Cowlitz specific forecasts for pre-season management; Fishery on excess HORs transported to upper Cowlitz and Cispus ABOVE those needed to replace NORs used for broodstock (hatchery equivalents);</p> <p>Once seeding/escapement goals are established and met: Potential for NOR harvest if above escapement goals Full Season Non-Mark-Selective fishery (HOR/NOR bag limits TBD); Potential for increased bag limits In-season management based on actual separator returns of HOR/NOR.</p>
Lower Cowlitz	<p>Utilize Cowlitz specific forecasts for pre-season management; Fishery on excess HORs ABOVE those needed for Cowlitz hatchery program (including demographic replacement).</p> <p>Once seeding/escapement goals are established for Upper Cowlitz/Cispus: Restricted Mark-Selective fishery (reduced bag limit or full closure); In-season management based on actual separator returns of HOR.</p>	<p>Utilize Cowlitz specific forecasts for pre-season management; Fishery on excess ABOVE those needed for Cowlitz hatchery program (including demographic replacement).</p> <p>Once seeding/escapement goals are established and met for Upper Cowlitz/Cispus: Potential for NOR harvest if above escapement goals Full Season Non-Mark-Selective fishery (HOR/NOR bag limits TBD); In-season management based on actual separator returns of HOR/NOR.</p>	<p>Utilize Cowlitz specific forecasts for pre-season management; Fishery on excess ABOVE those needed for Cowlitz hatchery program (including demographic replacement).</p> <p>Once seeding/escapement goals are established and met for Upper Cowlitz/Cispus: Potential for NOR harvest if above escapement goals Full Season Non-Mark-Selective fishery (HOR/NOR bag limits TBD); Potential for increased bag limits In-season management based on actual separator returns of HOR/NOR.</p>

Ocean/Columbia River	Columbia River: Mark-Selective; Ocean commercial and sport fishery is considered negligible. Cowlitz stock part of LCR spring Chinook aggregate for Columbia River Fishery Management. Seasons considered via North of Falcon;	Columbia River: Mark-Selective; Ocean commercial and sport fishery is considered negligible. Cowlitz stock part of LCR spring Chinook aggregate for Columbia River Fishery Management. Seasons considered via North of Falcon;	Columbia River: Mark-Selective; Ocean commercial and sport fishery is considered negligible. Cowlitz stock part of LCR spring Chinook aggregate for Columbia River Fishery Management. Seasons considered via North of Falcon;
Harvest Management Notes: Steps needed to achieve long term management: <ul style="list-style-type: none">Establish R_{max} for Upper Cowlitz and Cispus and develop escapement goalsDevelop Cowlitz specific forecasts for HOR and NOR spring Chinook returns.Improve juvenile collection and survival at CFFFUpdate FMEP to include long term strategy and consult with NMFS			
Program Performance Metrics			
Proportionate Natural Influence (PNI)		Target: Recent Performance:	
pHOS level		Target: NA Recent Performance: 0.921	
pNOB levels		Target: 0% Recent Performance: 0%	
Brood stock mining rate		Target: 0% Recent Performance: 0%	

Monitoring and Analysis needs associated with Adaptive Management trigger points

- Rough cut Seeding capacity estimate
 - Eventually a more comprehensive seeding capacity estimate
- Compare SAR analysis across neighboring basins
 - Lewis
 - Kalama
 - Clackamas
 - Sandy
- Conduct a life cycle/limiting factors analysis to determine factors influencing HOR survival within first year following Transition Plan finalization
 - Determine what is likely limiting survival
 - Consider life stages and appropriate Directed Studies following this analysis
-

Bio-programming considerations for all programs (capacity, water, how it fits with other programs):

- Problem Statement – Space and water reach in pinch point in Spring within current program configuration Bio-programming should evaluate this constraint and explore options to address this including use of net-pens for coho off-site rearing to create more space for Spring Chinook at CSH.

Potential Solutions

Pros

Cons

Timing

<p>Send Yearling Coho to net pens: By sending the coho to the net pens, pond space would become available to accommodate the Fall program at proper densities and provide additional compartments for different growth rates/size fish.</p>	<p>Coho typically do well in net pens Lighter densities may increase survivals Improves water quality during rearing Creates space for entire FA:CK program Reduces pressure to release spring Chinook early</p>	<p>Haven't tested coho in these pens, net pens have risk (vandalism, predation, environment, disease) 24 pens (708k fish= 47klbs) is a large operation and will be a time and cost addition (Currently only have 20 pens) Still need to truck fish OUT of pens = labor and stress increase - May require additional infrastructure at Mayfield dam for release Utilizes capacity that could be used for displacing coho for springs</p>	<p>2022</p>	
<p>Adjust Spring Chinook Release Size or Timing: Releasing fish at various sizes, would reduce the impacts. Emphasize yearling growth strategy, as much as possible, then backfill with subyearling strategy as necessary.</p>	<p>Emphasis on SAR while balancing number of fish released within program capacity.</p>	<p>Still requires additional pond space for full program. May not provide measurable benefits as a tactic on its own. SAR implications are untested</p>	<p>2022</p>	
<p>Release Coho or Spring Chinook early: Freeing up pond space will have the same impact as reducing program size. Same as sending coho to net pens as well.</p>	<p>Improves water quality during rearing Lighter densities may increase survivals Net Pens could benefit other programs Lower densities improves Falls survival</p>	<p>Will reduce adult returns Program reductions have a bad connotation and will likely be met with opposition. Increase residualization / predation of NOR's</p>	<p>2021</p>	

<p>Infrastructure: Adding or identifying additional rearing space is another option to address rearing challenges.</p> <ol style="list-style-type: none"> 1) Additional kettles would help with the challenges of separating the early rearing portion while merging them in size and subsequently ponds. 2) Additional ponds would help accommodate both early and later rearing challenges (same benefits as releasing other stocks to net pens or early) 3) Utilizing the adult ponds may be an option to displace other programs or rear Falls in for more space. (not ideal rearing conditions as they were not designed for juvenile rearing) 4) Utilize Trout Hatchery Remodel to accommodate other options 5) Additional net pens and potential new location 	<p>Additional kettles address early rearing challenges.</p> <p>Additional ponds address some early rearing and all later rearing challenges (coho in adult ponds frees some space for falls)</p> <p>Adult pond usage addresses some early rearing challenges but not all</p> <p>Trout Hatchery could be made to address all issues theoretically</p> <p>Additional net pens address rearing challenges</p> <p>Potential for funding partnerships (i.e. SRKW)</p> <p>Hatchery infrastructure/facilities have less risk than alternatives (net pens)</p>	<p>Add kettles: does not completely address later rearing challenges and cost is high</p> <p>Add ponds: Space where additions would occur is challenging and cost is very high with long timeline.</p> <p>Adult ponds: Not designed for juvenile rearing and would require upgrades, cost is moderate. This has been done with Coho Salmon juveniles in the past.</p> <p>Trout Hatchery: may conflict with other uses/plans; cost is high; may reduce adult recruitment to CSH and increase pHOS in Blue Cr/Lower Cowlitz spawning areas.</p> <p>Additional net pens: labor intensive; risk, cost is moderate (additional pens) to high (new pens/location)</p> <p>Largest cost of alternatives</p>	<p>2023++</p>
<p>Note: Bioprogramming will be revisited as a for all programs combined following drafting of all Transition Plans and incorporation of Public Input.</p>			

List of Reference Materials from Transition Plan Workshops.

Note: This Transition Plan is intended to serve as a step toward Recovery goals. It will be Evaluated for its progress toward achieving those objectives through the Annual Program Review (APR) as described in Chapter 12 of the Fisheries and Hatchery Management Plan (FHMP 2020), and will be altered through adaptive management as described in that process as necessary. The Hatchery Scientific Review Group (HSRG) evaluation guidelines will be evaluated for applicability during each step of recovery.