

Colville Confederated Tribes  
 Chief Joseph Hatchery  
 2023 APR Production Update

Colville Tribes Fish & Wildlife  
 Presenters

Matt McDaniel – CH Manager  
 Casey Baldwin – Sr. Research Scientist  
 Contributors

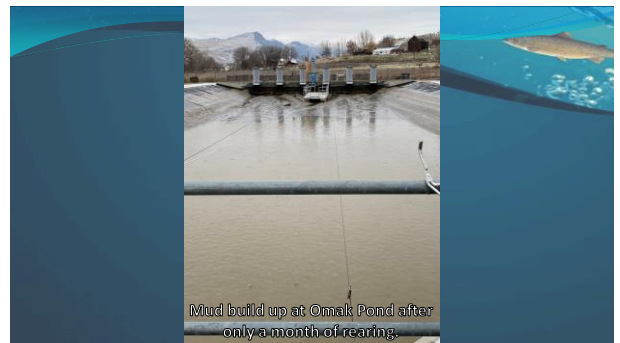
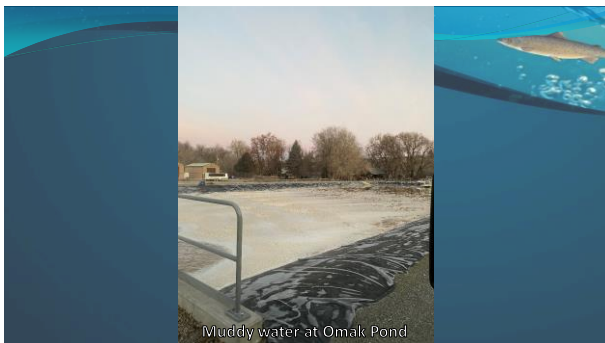
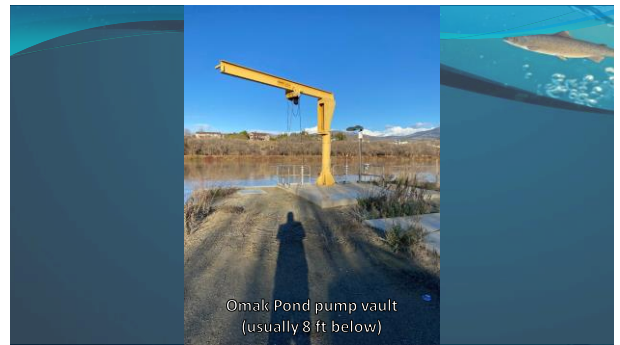
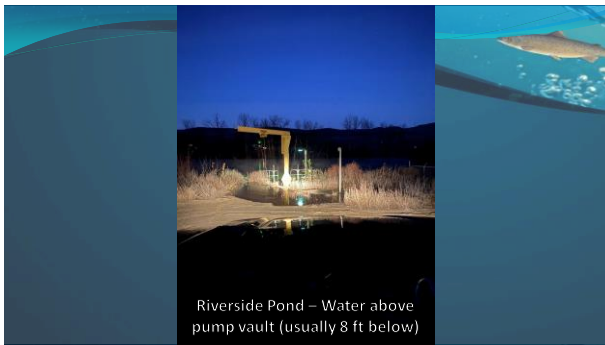
Jim Andrews – Assistant Manager  
 Tony Cleveland – Acclimation Ponds Lead  
 Brian Distz – Biologist  
 Andrea Pearl – Sr. Biologist



Summer Chinook  
 2022 Release Summary

Summer Chinook – Okanogan Stock							
Life History	Brood Year	Release Date(s)	Site	Method	Size (fpp)	# Fish	Target
Integrated Yearling*	2020	12/6/21	Omak AP (Okanogan R.)	Forced	30.2	207,773	400,000
Integrated Yearling*	2020	12/3/21	Similkameen AP	Forced	21.0	386,943	400,000
Segregated Yearling	2020	4/18/22	CIH (Columbia R.)	Forced	10.0	453,575	500,000
<b>SUBTOTAL:</b>						<b>1,048,291</b>	<b>1.3 M</b>
Integrated Sub-yearling	2021	N/A	Omak AP (Okanogan R.)	N/A	N/A	0	300,000
Segregated Sub-yearling	2021	6/8/22	CIH (Columbia R.)	Forced	47.0	134,706	400,000
<b>SUBTOTAL:</b>						<b>134,706</b>	<b>700,000</b>
<b>GRAND TOTAL:</b>						<b>1,182,997</b>	<b>2.0 M</b>

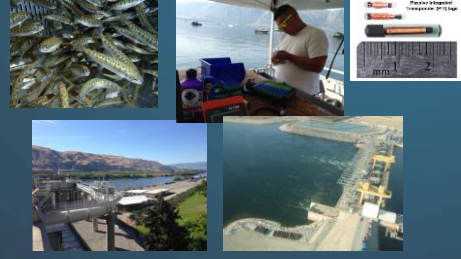
\*Integrated yearlings were released in Dec. 2021 due to poor rearing conditions caused by flooding.



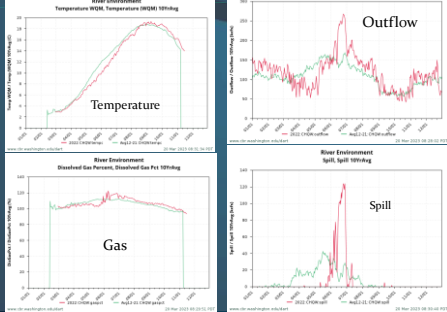
### KQM 4: Are the hatchery post-release targets met for survival?



### Methods: PIT tag mark-recapture using CJS model on DART



### In-river conditions

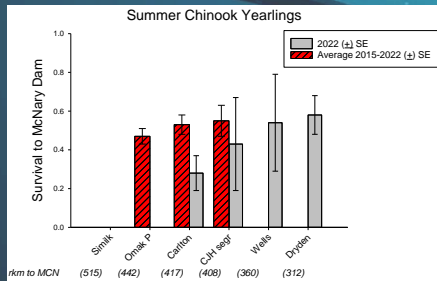


### Management Practices

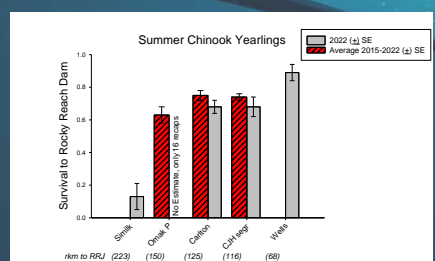
- 2022 night volitional release then 'force out' at CJH to reduce predation (SOP since 2016)
- Fish size and release timing:
  - SumChk Yearlings (CJH) FPP=16.7 (target = 10)
  - Spr Chk Yearlings (CJH) FPP=12.1 (target = 15)
  - SumChk Yearlings (Omak)\* FPP=30.2 (target = 15)
  - SumChk Subs (CJH) FPP=47.0 (target = 50)
  - CJH Yearlings released April 15-30
  - \*Omak yearlings released Dec. 2021 due to flooding Subs released June 6-7



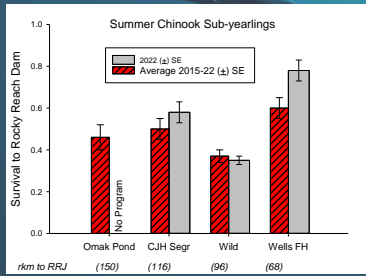
### Survival to McNary Dam



### Survival to Rocky Reach Dam



## Survival to Rocky Reach Dam



## Summer Chinook In-river Survival Summary

- McNary produced inconsistent and odd results again
  - Due to variable spill protocol
- Yearlings to RRJ
  - Slightly lower than avg. for C/JH segregated & Carlton
  - Omak and Similk.; released in the early winter flood
    - Initial effects look bad
    - We wont know for sure until adults return
- Subyearlings to RRJ
  - consistent, normal

## Gonadosomatic Index (GSI) Sampling

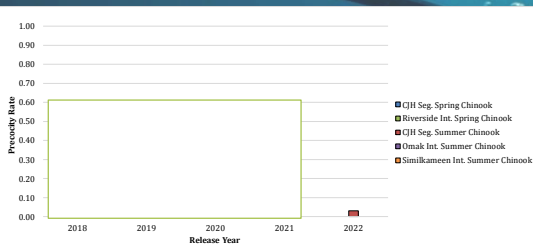
- Yearlings are held for a month after release, sampled in mid-May
- 300 fish from each release group sampled
- 5 total groups from integrated and segregated programs
- Measure weight and length of fish to determine the condition factor
- Identify males vs females based on presence of ovaries vs testes
- Dissect and remove gonads for all males and weigh on a micro scale to calculate the GSI Index
- Calculate the Log<sub>10</sub> (GSI) and graph the frequencies in a histogram to see the bimodal pattern of immature and mature males and
  - Determine the GSI threshold that separates immature and mature males
  - How many on each side of the threshold?



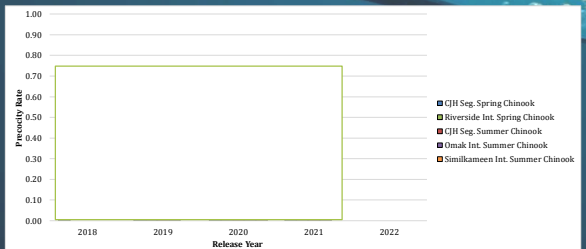
## Summary of Results

Program	2022 Release Totals	NAD Sample Date	Total Sample Size	No. of Samplers
Segregated Spring Chinook	814,613	Did not sample	N/A	N/A
Integrated Spring Chinook (10)	229,978 (Released 12/7/21)	Did not sample	N/A	N/A
Segregated Summer Chinook	453,575	5/23/22	290	4
Integrated Summer Chinook- Omak	207,773 (Released 12/5/21)	Did not sample	N/A	N/A
Integrated Summer Chinook- Similkameen	306,943 (Released 12/5/21)	Did not sample	N/A	N/A

## Precocity Rates (Visual)



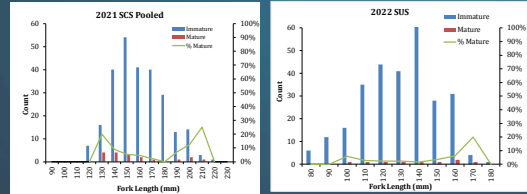
## Precocity Rates (Modeled)



## Summary of Results

Program	2022 Release Totals	% Males	Maturation %	Mature Males Released
Segregated Spring Chinook	814,613	N/A	N/A	N/A
Integrated Spring Chinook	229,978	N/A	N/A	N/A
Segregated Summer Chinook	453,575	48%	3.1%	6,702
Integrated Summer Chinook- Otsuk	207,773	N/A	N/A	N/A
Integrated Summer Chinook- Similkameen	386,943	N/A	N/A	N/A

## Are male forklengths at release related to early maturation?



## BY22 Summer Chinook Broodstock Survival to Spawn

Integrated (NOR)			
	# Fish Spawned	# Brood Collected	% Survival to Spawn
Females	279	310	90.0%
Males / Jacks	148 / 14	234 / 26	62.3%
<b>Total</b>	<b>441</b>	<b>570</b>	<b>77.4%</b>
Segregated (HOR)			
	# Fish Spawned	# Brood Collected	% Survival to Spawn
Females	226	283	79.9%
Males / Jacks	172 / 2	260 / 14	63.5%
<b>Total</b>	<b>400</b>	<b>557</b>	<b>71.8%</b>

Bio-criteria standard for survival to spawn: 90%

## BY22 Summer Chinook Integrated Egg Take

- **Integrated (NOR) Eyed-Egg Take Target: 1,296,405**
  - 686,898 total eyed eggs (53.0% of target)
- **Contributing factors to reduced eyed egg take:**
  - Pre-spawn survival below assumed 90% survival:
    - 77.4% actual, though female survival was 90%
  - Fecundity below assumed fecundity of 5,000
    - 4,064 actual (includes non-viable and culled eggs)
  - Low green to eyed egg survival of 90%:
    - 63.4% actual, with decreasing survival each spawn date

## BY22 Summer Chinook Integrated Egg Take

Integrated (NOR) Egg Take*					
Spawn Date	# Females Spawned	Green Eggs	Eyed Eggs	Fecundity	Green to Eyed Egg Survival
Oct. 5, 2022	11	44,985	43,837	4,089	97.4%
Oct. 12, 2022	31	115,046	116,804	3,711	77.3%
Oct. 19, 2022	84	335,865	239,557	3,998	71.3%
Oct. 26, 2022	80	325,567	182,261	4,069	56.0%
Nov. 3, 2022	43	176,176	93,240	4,097	52.9%
Nov. 8, 2022	21	85,153	39,097	4,055	45.9%
<b>Total</b>	<b>270</b>	<b>1,082,792</b>	<b>686,898</b>	<b>4,010</b>	<b>63.4%</b>

\*Non-viable and culled eggs are not included in these totals.

## BY22 Summer Chinook Segregated Egg Take

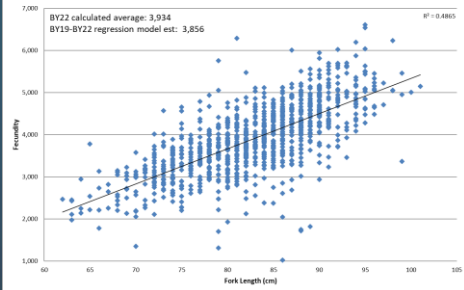
- **Segregated (HOR) Eyed-Egg Take Target: 1,060,200**
  - 619,199 total eyed eggs (58.4% of target)
- **Contributing factors to reduced eyed egg take:**
  - Pre-spawn survival below assumed 90% survival:
    - 71.8% actual, though female survival was 79.9%
  - Fecundity below assumed fecundity of 5,000
    - 3,830 actual (includes non-viable and culled eggs)
  - Low green to eyed egg survival of 90%:
    - 73.5% actual, with decreasing survival each spawn date

## BY22 Summer Chinook Segregated Egg Take

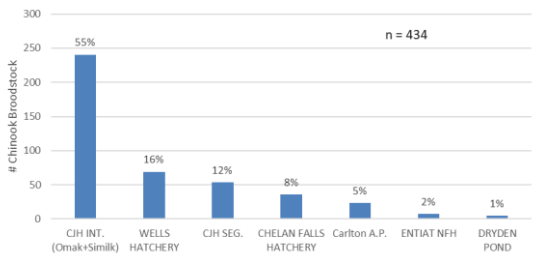
Segregated (HOR) Egg Take*					
Spawn Date	# Females Spawning	Green Eggs	Eyed Eggs	Fecundity	% Survival
Oct. 4, 2022	20	77,423	73,930	3,871	95.5%
Oct. 11, 2022	40	156,476	129,709	3,912	82.9%
Oct. 18, 2022	95	366,071	288,807	3,853	78.9%
Oct. 25, 2022	44	160,362	74,896	3,645	46.7%
Nov. 1, 2022	23	82,678	51,857	3,595	62.7%
<b>Total</b>	<b>222</b>	<b>843,010</b>	<b>619,199</b>	<b>3,797</b>	<b>73.5%</b>

\*Non-viable and culled eggs are not included in these totals.

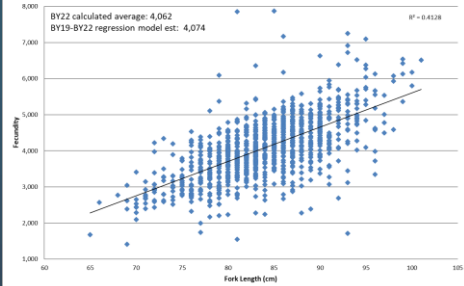
## BYs 2019 thru 2022 SEG Summer Broodstock Fork Length/Fecundity Correlation



## Summer Chinook Broodstock Composition by CWT Analysis



## Brood Years 2019 thru 2022 INT Summer Broodstock Fork Length/Fecundity Correlation



## Integrated (NOR) Summer Chinook In-Hatchery Performance

Parameter	Goal	Mean	# Years Targets Met	BY 2022 (88.5%)	BY 2021	BY 2020	BY 2019 (89% NOR)	BY 2018 (82% NOR)	BY 2017
Pre-spawn Survival	90%	77.2%	1/6	77.4%	75.4%	79.3%	95.8%	72.5%	62.6%
Eggs/Female	5,000	4,038	0/6	4,064 (1,028)	4,162 (409)	4,096	3,753	4,138	
Percent Eggs Culled	3%	0.32%	6/6	0.4%	0.4%	0.0%	0.0%	0.4%	0.7%
Green-to-Eyed Survival	90%	75.7%	0/6	63.4%	72.1%	80.4%	82.9%	67.7%	87.5%
Eyed Egg-to-Fry Survival	95%	78.7%	0/5	N/A	78.9%	80.7%	88.8%	54.4%	90.6%
Egg-to-Smolt Survival - Yearlings	86%	71.1%	1/4	N/A	43.8% <sup>a</sup>	77.1%	81.8%	38.2%	87.1%
Egg-to-Smolt Survival - Sub-yearlings	84%	77.8%	1/2	N/A	N/A	65.8%	89.7%	N/A	N/A
Releases - Yearlings	800,000	514,893 (64.4%)	0/4	N/A	300,000 <sup>a</sup>	594,716	708,336	235,740	520,780
Releases - Sub-yearlings	300,000	51,564 (17.2%)	0/5	N/A	0	88,474	160,344	0	0

<sup>a</sup> Beginning with BY21, fecundity includes non-viable eggs, with the smaller number being fecundity excluding those eggs.  
<sup>b</sup> Estimated as of March 15, 2023 and is not included in the Mean.

## Segregated (HOR) Summer Chinook In-Hatchery Performance

Parameter	Goal	Mean	# Years Targets Met	BY 2022	BY 2021	BY 2020	BY 2019	BY 2018	BY 2017
Pre-spawn Survival	90%	76.7%	0/6	71.8%	72.2%	81.2%	89.7%	66.0%	79.0%
Eggs/Female	5,000	3,842	0/6	2,820 (1,392)	4,053 (1,969)	3,676	4,046	3,571	3,877
Percent Eggs Culled	3%	0.36%	6/6	0.4%	0.8%	0.0%	0.0%	0.0%	1.0%
Green-to-Eyed Survival	90%	76.7%	0/6	73.2%	74.3%	81.4%	87.2%	56.3%	87.6%
Eyed Egg-to-Fry Survival	95%	81.9%	0/5	N/A	73.5%	86.1%	90.9%	69.1%	90.1%
Egg-to-Smolt Survival - Yearlings	86%	77.3%	1/4	N/A	67.8% <sup>a</sup>	84.8%	84.3%	52.8%	87.3%
Egg-to-Smolt Survival - Sub-yearlings	84%	82.4%	1/4	N/A	78.7%	80.0%	81.8%	N/A	89.1%
Releases - Yearlings	500,000	415,198 (83.0%)	1/4	N/A	416,434 <sup>a</sup>	453,669	568,625	189,967	399,299
Releases - Sub-yearlings	400,000	179,559 (44.9%)	0/5	N/A	134,706	177,932	396,433	0	182,462

<sup>a</sup> Beginning with BY21, fecundity includes non-viable eggs, with the smaller number being fecundity excluding those eggs.  
<sup>b</sup> Estimated as of March 15, 2023 and is not included in the Mean.

## SEG vs INT Summer Chinook Mean In-Hatchery Performance

Parameter	Goal	Segregated (NDR)	Integrated (NDR)	# Years Targets Met	
				Segregated	Integrated
Pre-spawn Survival	90%	76.7%	77.2%	0/6	1/6
Eggs/Female	5,000	3,842	4,038	0/6	0/6
Percent Eggs Culled	3%	0.36%	0.32%	6/6	6/6
Green-to-Eyed Survival	90%	76.7%	75.7%	0/6	0/6
Eyed Egg-to-Fry Survival	95%	81.9%	78.7%	0/5	0/5
Egg-to-Smolt Survival – Yearlings	86%	77.3%	71.1%	1/4	1/4
Egg-to-Smolt Survival – Sub-yearlings	84%	82.4%	77.8%	1/4	1/2
Releases – Yearlings		415,198* (83.0%)	514,893* (84.4%)	1/4	0/4
Releases – Sub-yearlings		179,559 (44.9%)	51,564 (73.2%)	0/5	0/5

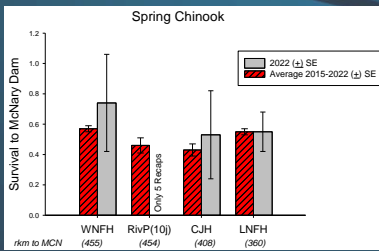
\*Does not include BY21.  
NOTE: No INT sub-yearlings in BYs 17, 18, 20 & 21 and no sub-yearlings for SEG program in BY18.

## Spring Chinook 2022 Release Summary

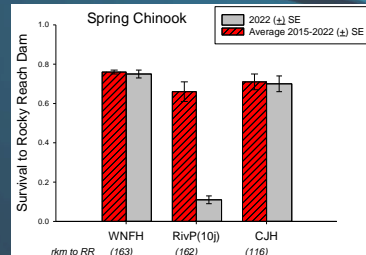
Spring Chinook							
Stock	Brood Year	Release Date(s)	Site	Method	Size (pp)	# Fish	Target
Leavenworth	2020	4/19/22	CJH (Columbia R.)	Forced	10.0	814,613	700,000
MetComp 10*	2020	12/7/21	Riverside AP (Okanagan R.)	Forced	19.0	229,978	200,000
<b>TOTAL:</b>						<b>1,044,591</b>	<b>900,000</b>

\*MetComp fish were released in Dec. 2021 due to poor rearing conditions caused by flooding.

## Survival to McNary Dam Spring Chinook



## Survival to Rocky Reach Dam Spring Chinook



## Spring Chinook Yearling In-river Survival Summary

- McNary produced inconsistent and odd results
  - Due to variable spill protocol.
- Survival to RRI was normal for CJH segregated
  - RivP / 10(j) released in the early winter flood
  - Initial effects look bad
  - We wont know for sure until adults return



## BY22 Spring Chinook Broodstock

Spring Chinook – CJH & LNFH Stock			
	# Fish Spawned	# Brood Collected*	% Survival to Spawn
Females	302	320	94.4%
Males / Jacks	203 / 6	301 / 8	67.6%
<b>Total</b>	<b>511</b>	<b>629</b>	<b>81.2%</b>

Bio-criteria standard for survival to spawn: 90%  
\*Brood collected includes 385 females and 266 males from LNFH.

## BY22 HOR Spring Chinook Egg Take

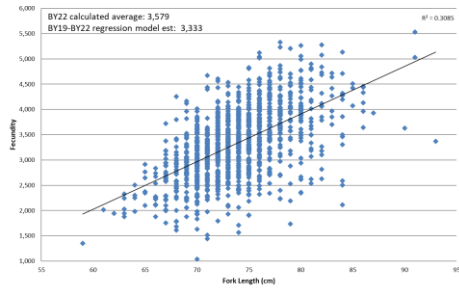
- **Eyed-Egg Take Target:** 787,968
  - 904,211 CJH eyed eggs (114.8% of target)
- **Contributing factors to increased eyed egg take:**
  - Pre-spawn mortality was very low in females (5.6%)
  - Increase in number of females spawned
  - Green to eyed egg survival exceeded goal (92.1%)
  - Culling rate of 0.54% much lower than the goal of 20%
- **Fecundity still below expectations:**
  - Actual: 3,579
  - Assumed: 3,800

## BY22 HOR Spring Chinook Egg Take

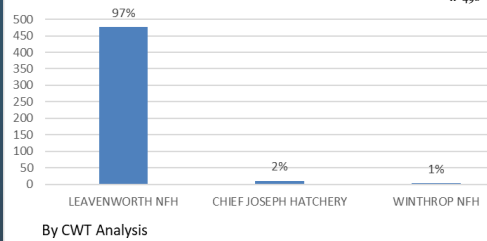
Spring Chinook Egg Take*					
Spawn Date	# Females Spawmed	Green Eggs	Eyed Eggs	Fecundity	Green to Eyed Egg Survival
Aug. 10, 2022	20	70,267	68,310	3,513	97.2%
Aug. 17, 2022	52	178,349	168,056	3,430	94.2%
Aug. 24, 2022	151	537,124	495,196	3,557	92.2%
Aug. 29, 2022	58	195,622	172,649	3,373	88.3%
<b>Total</b>	<b>281</b>	<b>981,362</b>	<b>904,211</b>	<b>3,492</b>	<b>92.1%</b>

\*Non-viable and culled eggs are not included in these totals.

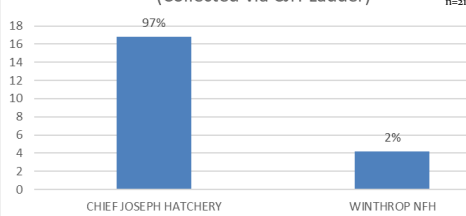
## BYs 2019 thru 2022 Spring Chinook Broodstock Fork Length/Fecundity Correlation



## Spring Chinook Broodstock Composition (Received from LNFH)



## Spring Chinook Broodstock Composition (Collected via CJH Ladder)



## HOR Spring Chinook In-Hatchery Performance

Parameter	Goal	Mean	# Years Targets Met	BY 2022 - CH & LNFH stock	BY 2021 - CH & LNFH stock	BY 2020 - CH stock	BY 2019 - CH stock	BY 2018 - CH stock	BY 2017 - LNFH stock
Pre-spawn Survival	90%	78.5%	1/6	81.2%	89.0%	97.2%	78.3%	32.8%	85.3%
Eggs/Female	3,800	3,320	0/6	3,579 (0.492)	3,471 (0.451)	3,218	2,987	3,014	3,649
Percent Eggs culled	20%	1.6%	6/6	0.54%	0.58%	0.36%	0.38%	0.01%	8.0%
Green-to-Eyed Survival	90%	83.6%	3/6	92.1%	89.6%	87.2%	93.1%	90.6%	48.7%
Eyed Egg-to-Fry Survival	95%	77.7%	2/5	N/A	98.9%	92.8%	98.6%	20.2%	78.2%
Egg-to-Smolt Survival	84%	65.5%	2/4	N/A	96.2% <sup>a</sup>	88.5%	89.7%	11.2%	72.5%
Releases	700,000	496,991 (71.0%)	2/4	N/A	907,356 <sup>a</sup>	814,717	793,984	102,702	276,560

<sup>a</sup>Beginning with BY21, fecundity includes non-viable eggs, with the smaller number being fecundity excluding those eggs.  
<sup>b</sup>Estimated as of March 31, 2023 and is not included in the Mean.

## MetComp 10j Spring Chinook In-Hatchery Performance

Parameter	Goal	Mean	# Years Targets Met	BY 2021*	BY 2020	BY 2019	BY 2018	BY 2017	BY 2016
Eyed Egg-to-Fry Survival	95%	84.5%	5/6	96.8%	97.0%	99.9%	14.9%	99.0%	99.4%
Egg-to-Smolt Survival	84%	77.2%	4/5	64.9%*	94.4%	90.9%	7.9%	95.3%	97.5%
Releases	200,000	176,242 (88.1%)	4/5	160,000*	229,978	222,508	17,315	210,582	200,827

\*BY21 Yearlings were released in Jan. 2023 due to pump failure at the Riverside Pond. Release number is estimated and final release number won't be known until smolts can be enumerated after the ice melts.

## Key Challenges to Date

- Broodstock Health**
  - Columnaris, more so in summer chinook
  - Deteriorating condition of brood with every spawn
  - Capacity maxed out
  - Raceway conditions (coarse concrete) contributing to an increase in roughed up fish.
- Fecundity**
  - Lower than expected fecundity contributes to low egg take.
- Green to eyed egg survival**
  - Deteriorating brood conditions contributes to lower quality gametes, leading to low green to eyed egg survival.

## KMQ #3: Is the hatchery meeting target in-hatchery performance standards?

Are the program goals and Key Assumptions realistic? Do they need adjustment?

## KMQ #3: Is the hatchery meeting target in-hatchery performance standards?

Are the program goals and Key Assumptions realistic? Do they need adjustment or are other management actions needed?

- Pre-spawn mortality (PSM)**
  - 1/6 years has target key assumption been met for Int. Summer Chinook
  - 0/6 years for Segregated Summer Chinook
  - 1/6 years for Segregated Spring Chinook
- Fecundity**
  - 0/6 years for Integrated Summer Chinook
  - 0/6 years for Segregated Summer Chinook
  - 0/6 years for Segregated Spring Chinook
- Warm water temps (resulting in Columnaris infection) and raceway conditions are main contributors to PSM. PSM will continue to be an issue without a cooler water source and improving rearing conditions. Low fecundity is also a contributing factor in not meeting production goals. PSM and fecundity are performance parameters that are consistently not meeting targets and should be re-evaluated.

## Summer Chinook 2023 Projected Releases

Summer Chinook – Okanogan Stock							
Life History	Brood Year	Projected Release Date	Site	Method	Est. Size (fpp)	# Fish	Target
Integrated Yearling	2021	4/17/2023	Omak AP (Okanogan R.)	Forced	10.0	50,000	400,000
Integrated Yearling	2021	4/17/2023	Similkameen AP	Forced	10.0	250,000	400,000
Segregated Yearling	2021	4/17/2023	CJH (Columbia R.)	Forced	10.0	415,000	500,000
<b>SUBTOTAL:</b>						<b>715,000</b>	<b>1.3 M</b>
Integrated Sub-yearling*	2022	N/A	Omak AP (Okanogan R.)	N/A	N/A	0	300,000
Segregated Sub-yearling	2022	5/15/2023	CJH (Columbia R.)	Forced	50.0	130,000	400,000
<b>SUBTOTAL:</b>						<b>130,000</b>	<b>700,000</b>
<b>GRAND TOTAL:</b>						<b>845,000</b>	<b>2.0 M</b>

\*Due to low egg take, there will not be an integrated sub-yearling program for BY22

## Spring Chinook 2023 Projected Releases

Spring Chinook							
Stock	Brood Year	Projected Release Date	Site	Method	Est. Size (fpp)	# Fish	Target
Leavenworth	2021	4/17/2023	CJH (Columbia R.)	Forced	10.0	905,000	700,000
MetComp 10j	2020	1/13/2023	Riverside AP (Okanogan R.)	Forced	25.8	160,000*	200,000
<b>TOTAL:</b>						<b>1,065,000</b>	<b>900,000</b>

\*BY21 MetComp Yearlings were released in Jan. 2023 due to pump failure at the Riverside Pond. Release number is estimated and final release number won't be known until smolts can be enumerated after the ice melts.



## Possible changes to be made 2023

- **Possible Juvenile Transfer Changes:**
  - Transfer acclimation pond fish when receiving water is within 5 ° F of CJH rearing water, regardless of actual water temperature.
  - Rear acclimation pond fish at CJH during winter months, transfer to acclimation ponds at least 6 weeks prior to release.
  - A combination of the first 2 scenarios, where a portion of the fish are transferred and a portion of the fish over-winter at CJH.

## Changes made in previous years that will continue to be a focus in 2023

- **Broodstock:**
  - Prophylactic treatment of Chloramine-T for Columnaris in all broodstock, plus Diquat when Columnaris detected.
  - Detailed necropsy data to identify any issues causing death.
  - Use Diquat during transport of summer broodstock
- **Spawning:**
  - First sort the day before first spawn, then all other sorts occur the morning of spawning.
  - Add salt to raceways during sort to reduce stress

## Changes made in previous years that will continue to be a focus in 2023

- **Incubation:**
  - Regular water monitoring on incubation water
  - Weekly visual assessment on eggs and not just relying on estimated TUs
  - Focus on fertilization procedures: ensure all culturists are following the same procedure consistently throughout the spawning seasons.
  - Increase monitoring of eggs during incubation, before and after picking.
- **Juvenile Rearing:**
  - Increase cleaning frequency of raceways and rearing ponds

## KMQ #3: Is the hatchery meeting target in-hatchery performance standards?

Are the program goals and Key Assumptions realistic?

### Do they need adjustment or are other management actions needed?

- **Possible solutions:**
  - PSM – The need for a cooler water source is evident to reduce Columnaris events. Coating raceways will help with reducing roughed up brood.
  - Fecundity – adjusting fecundity to a more realistic level should be seriously considered for future brood years. However, lowering fecundity while keeping the program goals the same increases broodstock needs.
  - Juvenile Survival – Constructing a building around the Riverside and Omak Acclimation Ponds will help in post-ponding juvenile survival.
  - Production Goals – do production goals need to be reevaluated?

