Colville Confederated Tribes
Chief Joseph Hatchery
2022 APR Production Update

Colville Tribes Fish & Wildlife

Presenters

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Contributors

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Summer Chinook
2021 Release Summary

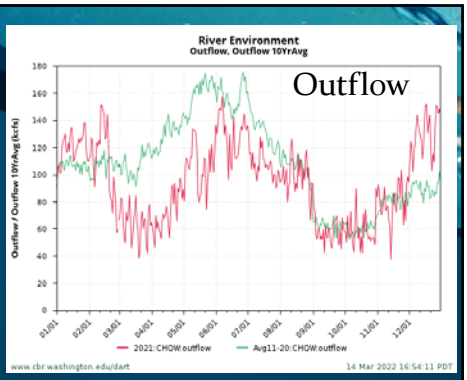
Summer Chinook – Okanogan Stock

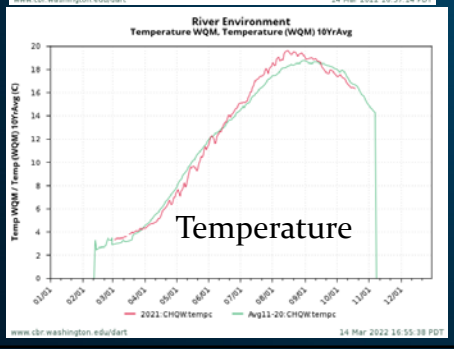
Life History	Brood Year	Release Date(s)	Site	Method	Size (fpp)	# Fish	Target
Integrated Yearling	2019	4/22/21	Omak AP (Okanogan R.)	Volitional	22.7	298,988	400,000
Integrated Yearling	2019	4/30/21	Similkameen AP	Volitional	17.0	409,348	400,000
Segregated Yearling	2019	4/20/21	CJH (Columbia R.)	Forced	10.0	568,625	500,000
			SUBTOTAL:			**1,276,961**	**1.3 M**
Integrated Sub-yearling	2020	5/27/21	Omak AP (Okanogan R.)	Forced	47.0	88,474	300,000
Segregated Sub-yearling	2020	6/3/21	CJH (Columbia R.)	Forced	74.4	177,932	400,000
			SUBTOTAL:			**266,406**	**700,000**
			GRAND TOTAL:			**1,543,367**	**2.0 M**

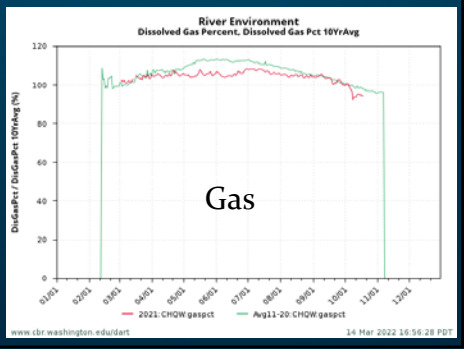
KQM 4: Are the hatchery post-release targets met for survival?

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

In-river conditions

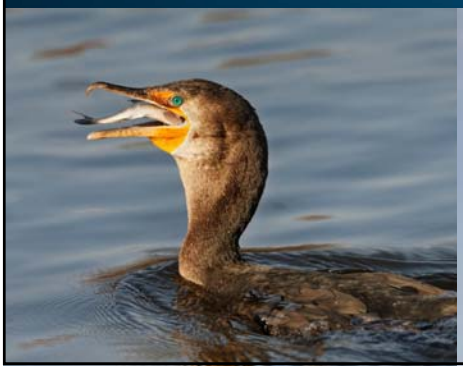




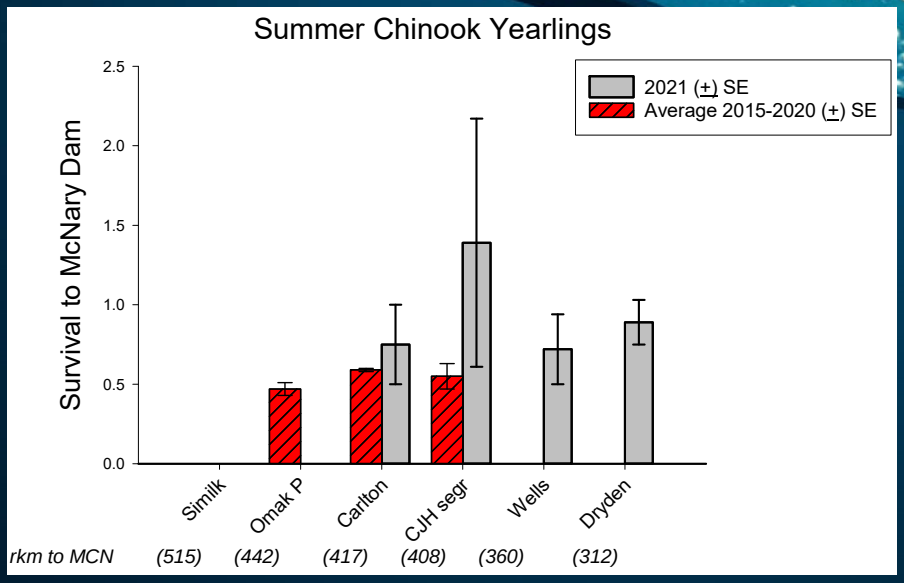


Management Practices

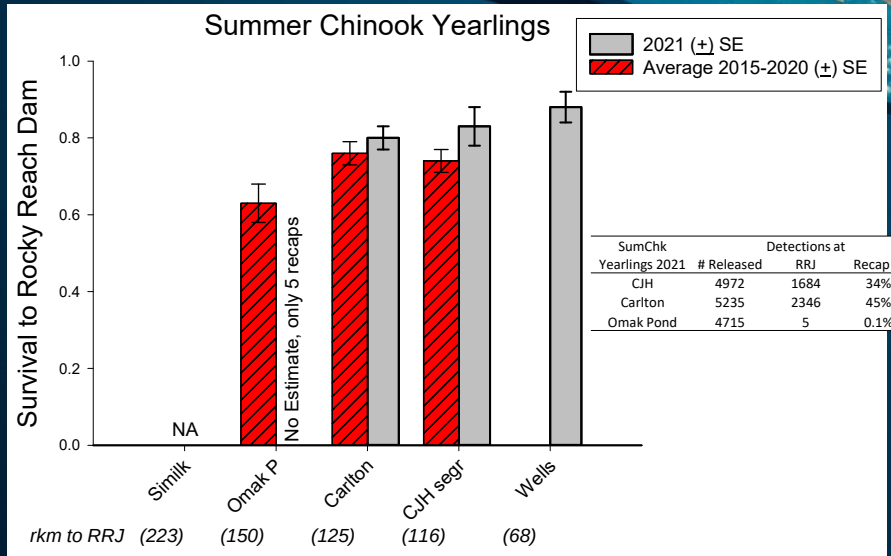
- 2021 night volitional release then 'force out' at CJH to reduce predation (SOP since 2016)
- Fish size and release timing:
  - SumChk Yearlings FPP=14.3 (target = 10)
  - Spr Chk Yearlings FPP=10 (target = 15)
  - SumChk Subs (Omak) FPP=47 (target = 50)
  - SumChk Subs (CJH) FPP=74.4 (target = 50)
  - Yearlings released April 15-30
  - Subs released May 27-June 3



Survival to McNary Dam

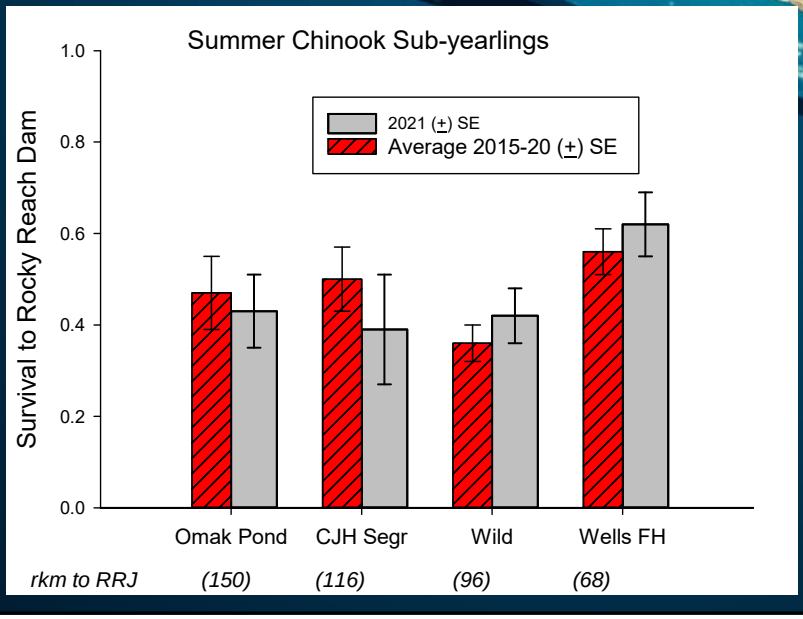


Survival to Rocky Reach Dam



SumChk Yearlings 2021	# Released	Detections at RRJ	Recap %
CJH	4972	1684	34%
Carlton	5235	2346	45%
Omak Pond	4715	5	0.1%

Survival to Rocky Reach Dam



Summer Chinook In-river Survival Summary

- McNary produced inconsistent and odd results
  - Due to variable spill protocol?
- Yearlings to RRJ
  - Slightly better than avg. for CJH segregated & Carlton
  - Omak Pond, something odd happened?
  - Similk. Pond- No data
- Subyearlings to RRJ
  - consistent, normal

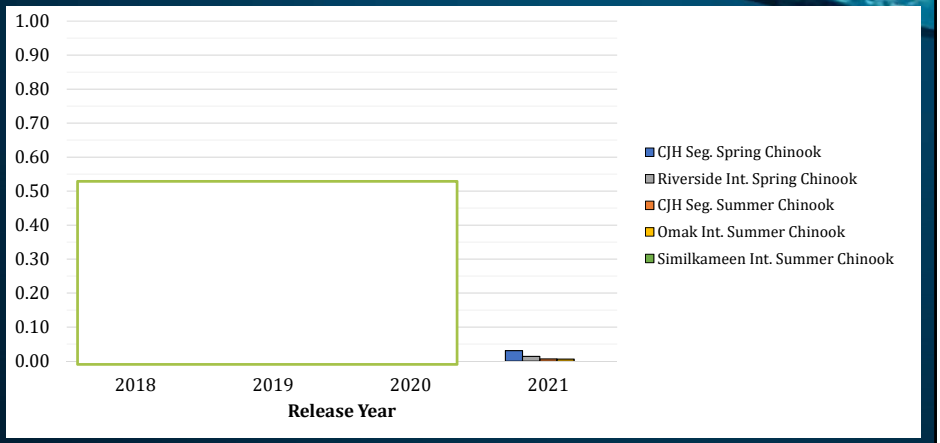
Gonadosomatic Index (GSI) Sampling

- 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 Log10 (GSI) and graph the frequencies in a histogram to see the bimodal pattern of immature and mature males
  - Determine the GSI threshold that separates immature and mature males
  - How many on each side of the threshold?

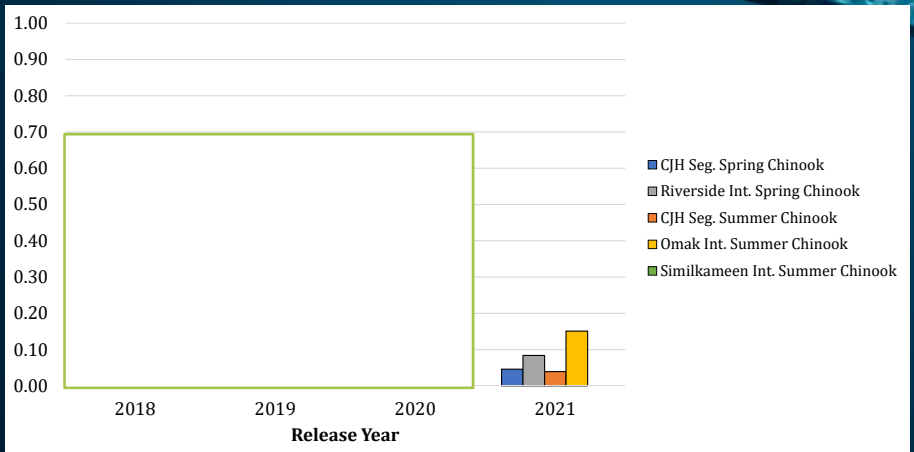
Summary of Results

Program	2021 Release Totals	NAD Sample Date	Total Sample Size	No. of Samplers
Segregated Spring Chinook	793,984	5/18/21	300	7
Integrated Spring Chinook (10j)	222,508	5/12/21	298	7
Segregated Summer Chinook	568,675	5/17/21	291	7
Integrated Summer Chinook- Omak	398,988	5/17/21	300	7
Integrated Summer Chinook- Similkameen	409,000	5/13/21	300	7

Precocity Rates (Visual)



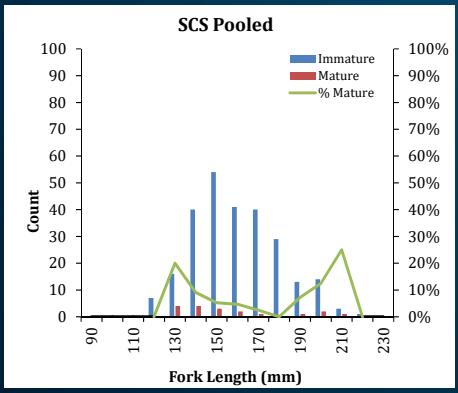
Precocity Rates (Modeled)

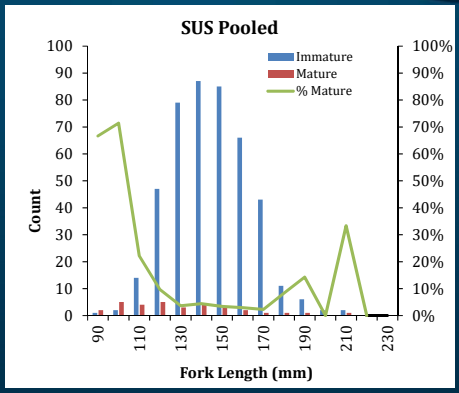


Summary of Results

Program	2021 Release Totals	Males Sampled %	Maturation %	Mature Males Released
Segregated Spring Chinook	793,984	43%	4.62%	15,896
Integrated Spring Chinook	222,508	48%	8.39%	8,958
Segregated Summer Chinook	568,675	53%	3.92%	11,721
Integrated Summer Chinook- Omak	398,988	57%	15.12%	34,587
Integrated Summer Chinook- Similkameen	409,000	50%	0.00%	0

Are male forklengths at release related to early maturation?





Other questions?

- Can we visually assess early maturation in males?
  - Gonad weight vs maturation
  - GSI vs maturation
- Can gonad weight assess early maturation in males?
  - GSI vs gonad weight

BY21 Summer Chinook Broodstock Survival to Spawn

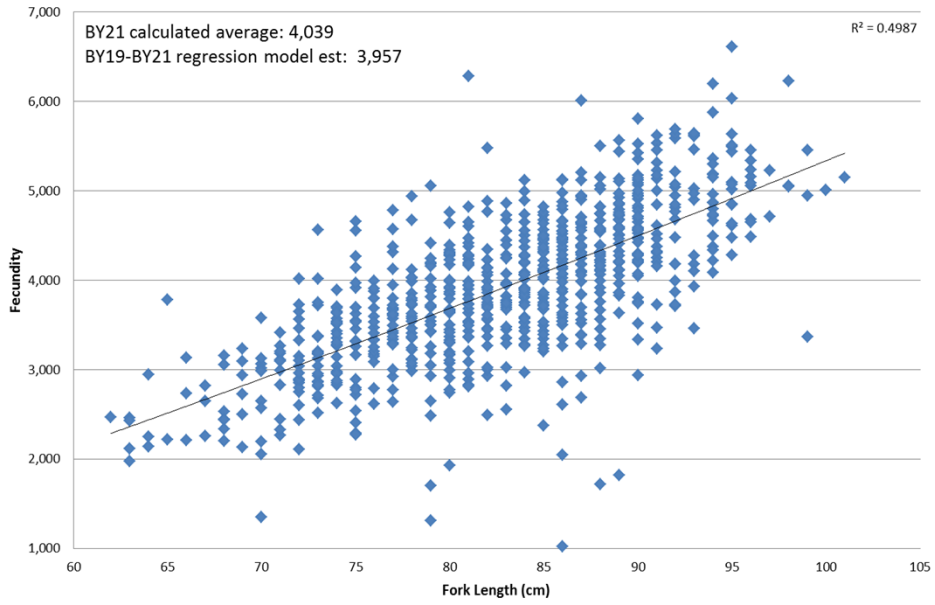
Integrated (NOR)			
	# Fish Spawned	# Brood Collected	% Survival to Spawn
Females	234	330	66.8%
Males / Jacks	205 / 0	350 / 4	80.5%
Total	**439**	**699**	**74.0%**
Segregated (HOR)			
	# Fish Spawned	# Brood Collected	% Survival to Spawn
Females	267	356	75.0%
Males / Jacks	217 / 2	320 / 11	70.7%
Total	**486**	**687**	**72.9%**

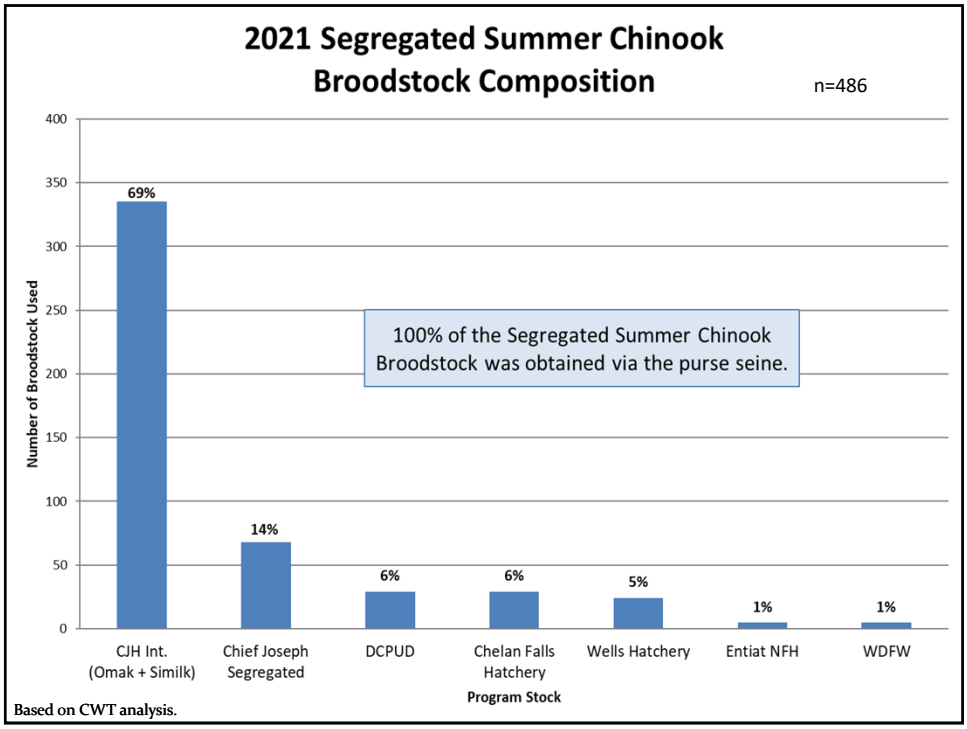
Bio-criteria standard for survival to spawn: 90%

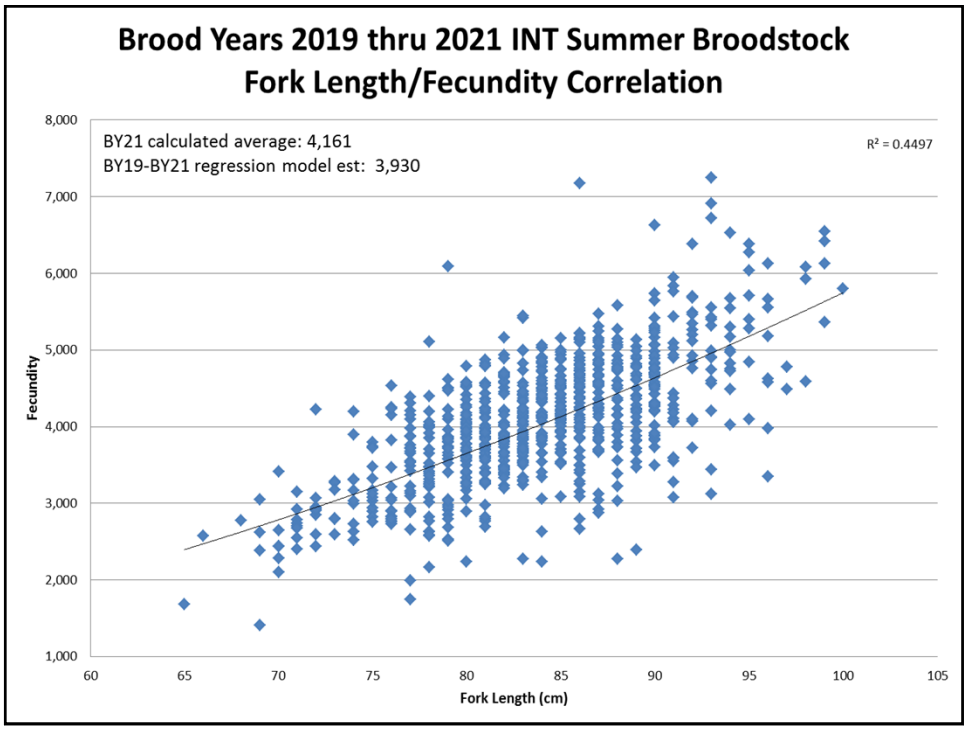
BY21 Summer Chinook Egg Take

- **Integrated (NOR) Eyed-Egg Take Target: 1,296,405**
  - 685,079 total eyed eggs (52.8% of target)
- **Segregated (HOR) Eyed-Egg Take Target: 1,060,200**
  - 785,634 total eyed eggs (74.1% of target)
- **Contributing factors to reduced eyed egg take:**
  - Fecundity below assumed fecundity of 5,000
    - 4,162 actual for integrated
    - 4,053 actual for segregated
  - Low green to eyed egg survival:
    - 72.1% for integrated
    - 74.3% for segregated

BYs 2019 thru 2021 SEG Summer Broodstock Fork Length/Fecundity Correlation




2021 Segregated Summer Chinook
Broodstock Composition
n=486
Number of Broodstock Used
400
350
300
250
200
150
100
50
0
69%
14%
6%
6%
5%
1%
1%
100% of the Segregated Summer Chinook Broodstock was obtained via the purse seine.
CJH Int. (Omak + Similk)
Chief Joseph Segregated
DCPUD
Chelan Falls Hatchery
Wells Hatchery
Entiat NFH
WDFW
Program Stock
Based on CWT analysis.


Brood Years 2019 thru 2021 INT Summer Broodstock
Fork Length/Fecundity Correlation
BY21 calculated average: 4,161
BY19-BY21 regression model est: 3,930
R² = 0.4497
Fecundity
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
60
65
70
75
80
85
90
95
100
105
Fork Length (cm)

Integrated (NOR) Summer Chinook In-Hatchery Performance

Parameter	Goal	Mean	# Years Targets Met	BY 2021	BY 2020	BY 2019 (59% NOB)	BY 2018 (62% NOB)	BY 2017	BY 2016
Pre-spawn Survival	**90%**	**79.1%**	1/6	75.4%	79.3%	95.8%	72.5%	62.6%	88.7%
Eggs/Female	**5,000**	**4,096**	0/6	4,162* (4,061)	4,012	4,096	3,745	4,138	4,413
Percent Eggs Culled	**3%**	**0.25%**	6/6	0.4%	0.0%	0.0%	0.4%	0.7%	0.0%
Green-to-Eyed Survival	**90%**	**79.4%**	0/6	72.1%	80.2%	82.9%	67.7%	87.5%	85.8%
Eyed Egg-to-Fry Survival	**95%**	**81.8%**	0/5	N/A	85.2%	88.8%	54.4%	90.6%	90.0%
Egg-to-Smolt Survival – Yearlings	**86%**	**74.5%**	2/5	N/A	77.1%	81.8%	38.2%	87.1%	88.3%
Egg-to-Smolt Survival – Subyearlings	**84%**	**74.1%**	1/3	N/A	65.8%	89.7%	N/A	N/A	66.9%
Releases – Yearlings	**800,000**	**547,561 (68.4%)**	0/5	N/A	594,716	708,336	235,740	520,780	678,233
Releases – Sub-yearlings	**300,000**	**94,924 (31.6%)**	0/5	N/A	88,474	169,344	0	0	216,804

*Fecundity includes non-viable eggs, which were enumerated for the first time with BY21. The smaller number is fecundity excluding those eggs.
NOTE: BY20 Yearlings were released in Dec. 2021 due to comprised health with deteriorating rearing conditions during a flood event.

Segregated (HOR) Summer Chinook In-Hatchery Performance

Parameter	Goal	Mean	# Years Targets Met	BY 2021	BY 2020	BY 2019	BY 2018	BY 2017	BY 2016
Pre-spawn Survival	**90%**	**79.1%**	0/6	72.2%	81.2%	89.7%	66.0%	79.0%	86.5%
Eggs/Female	**5,000**	**3,944**	0/6	4,053* (3,960)	3,676	4,046	3,571	3,877 (3,917)	4,438
Percent Eggs Culled	**3%**	**0.30%**	6/6	0.8%	0.0%	0.0%	0.0%	1.0%	0.0%
Green-to-Eyed Survival	**90%**	**78.8%**	0/6	74.3%	81.4%	87.2%	56.3%	87.6%	85.7%
Eyed Egg-to-Fry Survival	**95%**	**79.7%**	0/5	N/A	67.9%	90.9%	69.1%	90.1%	80.3%
Egg-to-Smolt Survival – Yearlings	**86%**	**77.4%**	1/4	N/A	84.8%^	84.3%	52.8%	87.3%	85.0%
Egg-to-Smolt Survival – Subyearlings	**84%**	**75.7%**	1/4	N/A	80.0%	81.8%	N/A	89.1%	51.7%
Releases – Yearlings	**500,000**	**405,580 (81.1%)**	1/4	N/A	453,669^	568,625	189,967	399,299	464,429
Releases – Sub-yearlings	**400,000**	**188,530 (47.1%)**	0/5	N/A	177,932	396,433	0	182,462	185,821

*Fecundity includes non-viable eggs, which were enumerated for the first time with BY21. The smaller number is fecundity excluding those eggs.
^As of March 14, 2022 and is not included in the Mean.

SEG vs INT Summer Chinook Mean In-Hatchery Performance

Parameter	Goal	Segregated (HOR)	Integrated (NOR)	# Years Targets Met Segregated	# Years Targets Met Integrated
Pre-spawn Survival	**90%**	**79.1%**	**79.1%**	0/6	1/6
Eggs/Female	**5,000**	**3,944**	**4,096**	0/6	0/6
Percent Eggs Culled	**3%**	**0.30%**	**0.25%**	6/6	6/6
Green-to-Eyed Survival	**90%**	**78.8%**	**79.4%**	0/6	0/6
Eyed Egg-to-Fry Survival	**95%**	**79.7%**	**81.8%**	0/5	0/5
Egg-to-Smolt Survival – Yearlings	**86%**	**77.4%***	**74.5%**	1/4	2/5
Egg-to-Smolt Survival – Sub-yearlings	**84%**	**75.7%**	**74.1%**	1/4	1/3
Releases – Yearlings		**405,580*** (81.1%)	**547,561** (68.4%)	1/4	0/5
Releases – Sub-yearlings		**188,530** (47.1%)	**94,924** (31.6%)	0/5	0/5

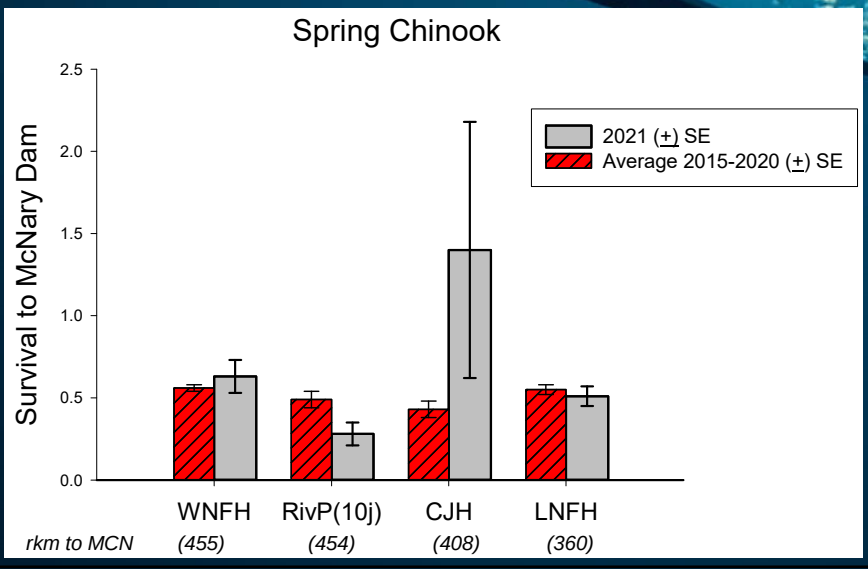
*Does not include BY20.
NOTE: No INT sub-yearlings in BY17 and no sub-yearlings for either program in BY18.

Spring Chinook 2021 Release Summary

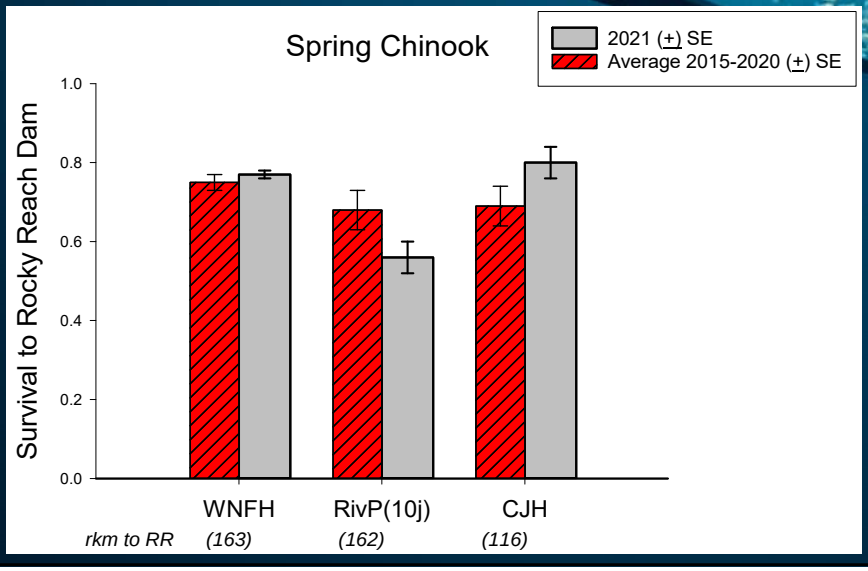
Spring Chinook

Stock	Brood Year	Release Date(s)	Site	Method	Size (fpp)	# Fish	Target
Leavenworth	2019	4/20/21	CJH (Columbia R.)	Forced	10.0	793,984	700,000
MetComp 10j	2019	4/15/21	Riverside AP (Okanogan R.)	Forced	19.0	222,508	200,000
				TOTAL:		**1,016,492**	**900,000**

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
  - For Spr Chk its isolated to CJH Segr (same issue as Sum Chk)
  - Due to variable spill protocol?

- Survival to RRJ was in the normal range
  - Slightly low for RivP, a little higher than avg for CJH, normal for WNFH

BY21 Spring Chinook Broodstock

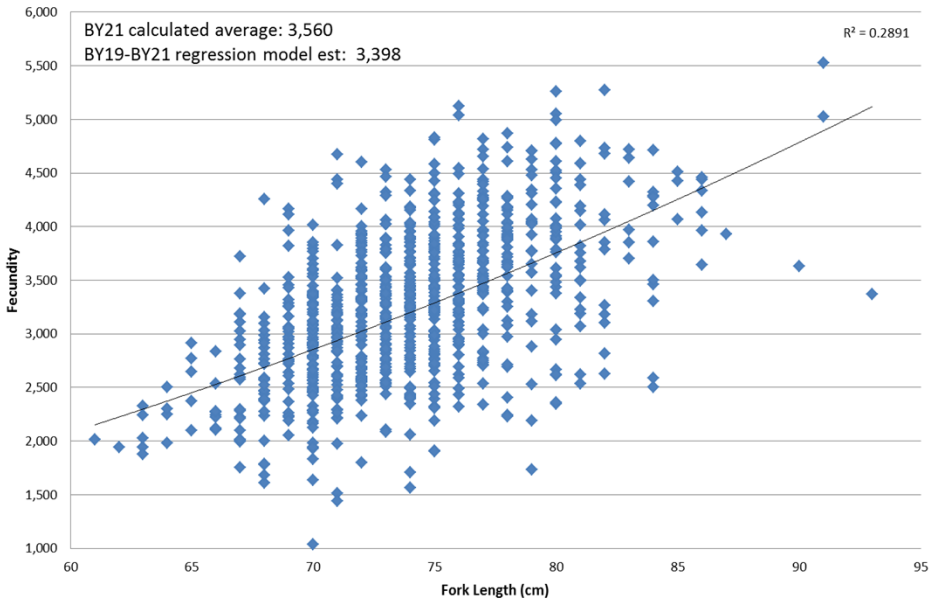
Spring Chinook – CJH & LNFH Stock			
	# Fish Spawned	# Brood Collected*	% Survival to Spawn
Females	305	324	94.4%
Males / Jacks	201 / 6	259 / 6	82.3%
Total	**512**	**589**	**89.0%**

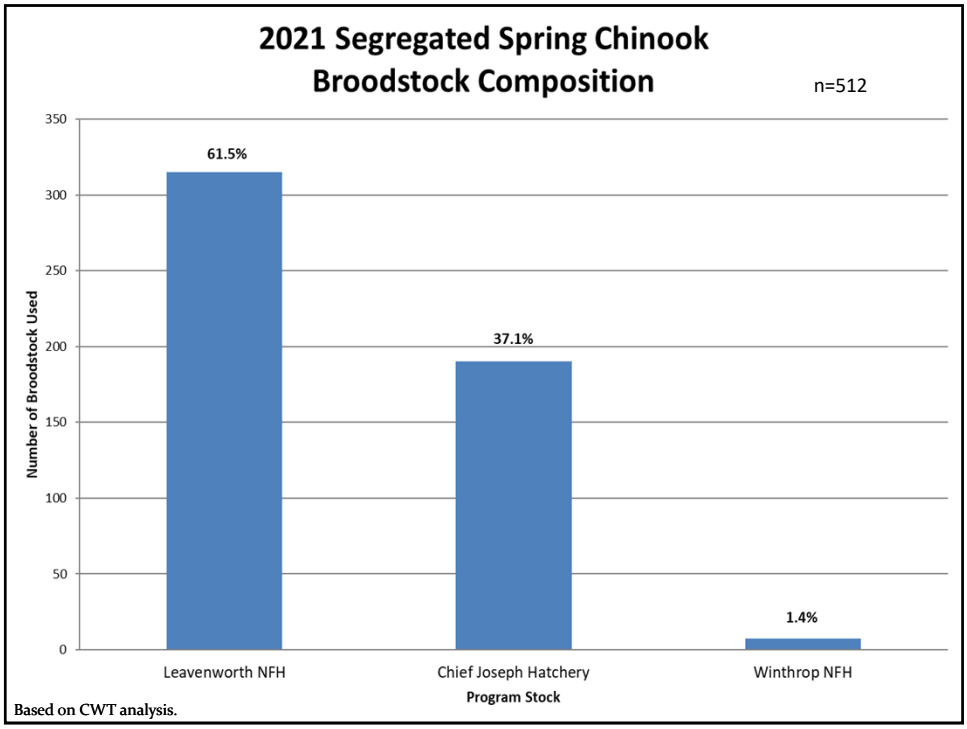
Bio-criteria standard for survival to spawn: 90%
*Brood collected includes 189 females and 149 males from LNFH.

BY21 HOR Spring Chinook Egg Take

- **Eyed-Egg Take Target: 787,968**
  - 942,969 CJH eyed eggs (119.7% 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
- **Fecundity still below expectations:**
  - Actual: 3,471
  - Assumed: 3,800

BYs 2019 thru 2021 Spring Chinook Broodstock Fork Length/Fecundity Correlation





HOR Spring Chinook In-Hatchery Performance

Parameter	Goal	Mean	# Years Targets Met	BY 2021 – CJH & LNFH stock	BY 2020 – CJH stock	BY 2019 – CJH stock	BY 2018 – CJH stock	BY 2017 – CJH stock	BY 2016 – LNFH stock
Pre-spawn Survival	**90%**	**78.5%**	1/6	89.0%	97.2%	78.3%	32.8%	85.3%	88.5%
Eggs/Female	**3,800**	**3,355**	0/6	3,471* (3,451)	3,218	2,987	3,014	3,259	3,792
Percent Eggs culled	**20%**	**1.6%**	6/6	0.58%	0.36%	0.38%	0.01%	8.0%	0.03%
Green-to-Eyed Survival	**90%**	**77.9%**	2/6	89.6%	87.2%	93.1%	90.6%	48.7%	58.1%
Eyed Egg-to-Fry Survival	**95%**	**77.7%**	2/5	N/A	92.8%	98.6%	20.2%	78.2%	98.9%
Egg-to-Smolt Survival	**84%**	**65.9%**	2/4	N/A	88.5%^	89.7%	11.2%	72.5%	90.2%
Releases	**700,000**	**432,221 (61.7%)**	1/4	N/A	814,717^	793,984	102,702	276,560	555,636

*Fecundity includes non-viable eggs, which were enumerated for the first time with BY21. The smaller number is fecundity excluding those eggs.
^As of March 14, 2022 and is not included in the Mean.

MetComp 10j Spring Chinook In-Hatchery Performance

Parameter	Assump-tion	Mean	# Years Targets Met	BY 2020	BY 2019	BY 2018	BY 2017	BY 2016	BY 2015
Eyed Egg-to-Fry Survival	**95%**	**86.9%**	5/6	97.0%	99.9%	14.0%	99.0%	99.4%	99.1%
Egg-to-Smolt Survival	**84%**	**82.2%**	5/6	94.4%	90.9%	7.9%	95.3%	97.5%	96.3%
Releases	**200,000**	**183,763** (91.9%)	5/6	229,978	222,508	17,315	210,582	200,827	201,821

NOTE: BY20 Yearlings were released in Dec. 2021 due to comprised health with deteriorating rearing conditions during a flood event.

Key Challenges to Date

- **Disease Issues**
  - Columnaris in all broodstock due to warm well water, more of an issue in summer chinook for BY21.
- **Fecundity**
  - Lower than expected fecundity contributes to low egg take.
- **Broodstock Capacity**
  - Additional broodstock not an option as broodstock rearing capacity is at its max.

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?

- **Prespawn 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
- Low fecundity and warm water temps, resulting in Columnaris infection and thus inflicting elevated PSM, are outside of staff control. PSM will continue to be an issue without a cooler water source along with continued chemical treatment. Both are performance parameters that are consistently not meeting targets and should be re-evaluated.

Summer Chinook
2022 Projected Releases

Summer Chinook – Okanogan Stock

Life History	Brood Year	Projected Release Date	Site	Method	Est. Size (fpp)	# Fish	Target
Integrated Yearling	2020	12/3/2021	Omak AP (Okanogan R.)	Forced	30.2	207,773	400,000
Integrated Yearling	2020	12/6/2021	Similkameen AP	Forced	21.0	386,943	400,000
Segregated Yearling	2020	4/15/2022	CJH (Columbia R.)	Forced	10.0	550,000	500,000
				SUBTOTAL:		**1.144 M**	**1.3 M**
Integrated Sub-yearling*	2021	N/A	Omak AP (Okanogan R.)	N/A	N/A	0	300,000
Segregated Sub-yearling	2021	5/15/2022	CJH (Columbia R.)	Forced	50.0	150,000	400,000
				SUBTOTAL:		**150,000**	**700,000**
				GRAND TOTAL:		**1.294 M**	**2.0 M**

*Due to low egg take, there will not be an integrated sub-yearling program for BY21

Spring Chinook
2022 Projected Releases

Spring Chinook

Stock	Brood Year	Projected Release Date	Site	Method	Est. Size (fpp)	# Fish	Target
Leavenworth	2020	4/15/2022	CJH (Columbia R.)	Forced	10.0	770,000	700,000
MetComp 10j	2020	12/7/2021	Riverside AP (Okanogan R.)	Forced	25.8	229,978	200,000
				TOTAL:		**999,978**	**900,000**

Changes made in previous years that will continue to be a focus in 2022

- **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 2022

- **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; we need cooler water during adult rearing to reduce Columnaris events.
  - 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.
  - Production Goals – do production goals need to be reevaluated?