The Chief Joseph Hatchery
2023 Annual Program Review

March 29-30, 2023

Virtual Meeting

Table of Contents

Part 1 – Program Overview

CHIEF JOSEPH HATCHERY AT A GLANCE

1. RESERVOIR WATER INTAKE
On the upstream face of Chief Joseph Dam, a screened intake draws water from the dam's reservoir for use at the hatchery. A 36" steel pipe on the downstream face of the dam delivers the water to a buried pipeline starting near the foot of the dam.

2. RESERVOIR WATER PIPELINE
The buried pipeline conveys water drawn from the dam's reservoir to the hatchery headbox.

3. FISH LADDER
Cool water from the hatchery flows through this ladder to attract adult Chinook salmon that have returned after several years in the ocean.

4. ADULT SALMON RACEWAYS
Adult salmon ("broodstock") that are collected on the purse seine fishing boat, weir, or enter the fish ladder are directed to raceways where they are held until their eggs ripen.

5. SPAWNING BUILDING
In the spawning building, fish culturists collect and fertilize eggs from the returned adult fish. The fertilized eggs are transferred to the main hatchery, where they are placed in incubators.

6. MULTI-USE PIPELINE CORRIDOR
Major pipelines run through the corridor between the main hatchery and the broodstock area. These include the reservoir-water supply line going to the headbox, a groundwater supply line going to the spawning building, and a hatchery water discharge line going to the fish ladder.

7. ADMINISTRATION BUILDING
Hatchery managers and administrative staff work in this building, which also features meeting space and an educational display area.

8. PUBLIC USE TRAIL
A trail outside the fenced hatchery grounds has been reconstructed for public use.

9. GROUNDWATER PIPELINE CORRIDOR
A pipeline buried in this corridor delivers groundwater to the hatchery from five wells at Bridgeport State Park.

10. HEADBOX
The headbox is the central arrival point for water supply to the hatchery. Groundwater and reservoir water are aerated, excess nitrogen is removed, the river water is filtered, and the water is conveyed to various end uses at the hatchery.

11. STORAGE BUILDING
This building is the hatchery's home for supplies, spare parts, vehicles and trailers.

12. HATCHERY BUILDING
This 14,000-square-foot building is where salmon eggs are incubated and salmon fry are raised. It also houses a laboratory, a shop area, some offices, fish food storage, and equipment for treating and chilling water.

13. REARING RACEWAYS
Chinook salmon fry are raised to small fingerlings in these two banks of 20 raceways, each 10 feet wide and 110 feet long.

14. REARING PONDS
Chinook salmon are raised from fingerlings to smolts in 210-foot-long rearing ponds, one that is 80 feet wide and two that are 50 feet wide.

15. CLEANING WASTE POND
Fish waste from the rearing raceways and ponds settles in this pond for later removal from the site.

16. GENERATOR
A generator is available on site to provide power in the event of failure of the main power source for any reason.

Columbia River Treaty 2014/2024 Review Program Columbia River Watershed Dams

BRITISH COLUMBIA
ALBERTA
CANADA
UNITED STATES OF AMERICA
WASHINGTON
OREGON
IDAHO
MONTANA
WYOMING
NEVADA
UTAH

Upper Columbia River
Kootenai-Pend Oreille-Spokane Rivers
Middle Columbia River
Lower Columbia River
Mainstem Columbia River
Willamette River
Lower Snake River
Upper Snake River

North Fork Columbia River
Columbia River
Kootenay River
Duncan River
Pend Oreille River
Priest River
Kootenai River
Clark Fork
Thompson River
North Fork Flathead River
South Fork Flathead River
Flathead River
Spokane River
Sanpoil River
Methow River
Chelan River
Naches River
Yakima River
Cowlitz River
Lewis River
Deschutes River
Clackamas River
North Santiam River
South Santiam River
McKenzie River
Grande Ronde River
Snake River
Clearwater River
North Fork Clearwater River
Powder River
Malheur River
Owyhee River
Boise River
Henry's Fork
Little Wood River

Mica
Revelstoke
Duncan
Corra Linn & Kootenay Canal Projects
Lower Bonnington
Upper Bonnington
Slocan
Brilliant
Arrow Lakes/ Hugh Keenleyside
Seven Mile
Waneta
Boundary
Box Canyon
Bonners Ferry
Priest Lake
Libby
Columbia Falls
Hungry Horse
Hungry Horse Reservoir
Albeni Falls
Cabinet Gorge
Lake Pend Oreille
Noxon Rapids
Flathead Lake
Kerr
Thompson Falls
Long Lake
Grand Coulee
Lake Chelan
Wells
Chief Joseph
Chelan
Banks Lake
Little Falls
Nine Mile
Post Falls
Coeur d'Alene Lake
Spokane
Monroe Street
Upper Falls
Rocky Reach
Wenatchee
Rock Island
Keechelus
Kachess
Cle Elum
Bumping Lake
Tieton
Yakima
Priest Rapids
Wanapum
Lower Monumental
Little Goose
Lower Granite
Dworshak
Lewiston
Missoula
Clark Fork
Pasco
Richland
Kennewick
Ice Harbor
McNary
Riffe Lake
Vancouver
Hillsboro
Gresham
Beaverton
Portland
Bonneville
The Dalles
John Day
Willamette
Salem
Pelton Rereg
Pelton
Round Butte
Bend
Eugene
Springfield
Hells Canyon
Oxbow
Brownlee
Cascade
Deadwood
Owyhee
Boise
Nampa
Arrowrock
Lucky Peak
Anderson Ranch
Idaho Falls
Jackson Lake
Palisades
American Falls
Pocatello

Columbia River Treaty 2014/2024 Review Program Columbia River Watershed Dams

- City
- Modeled Dam
- State/Province
- Stream Centerline
- CRT Region

N

0 50 100 200

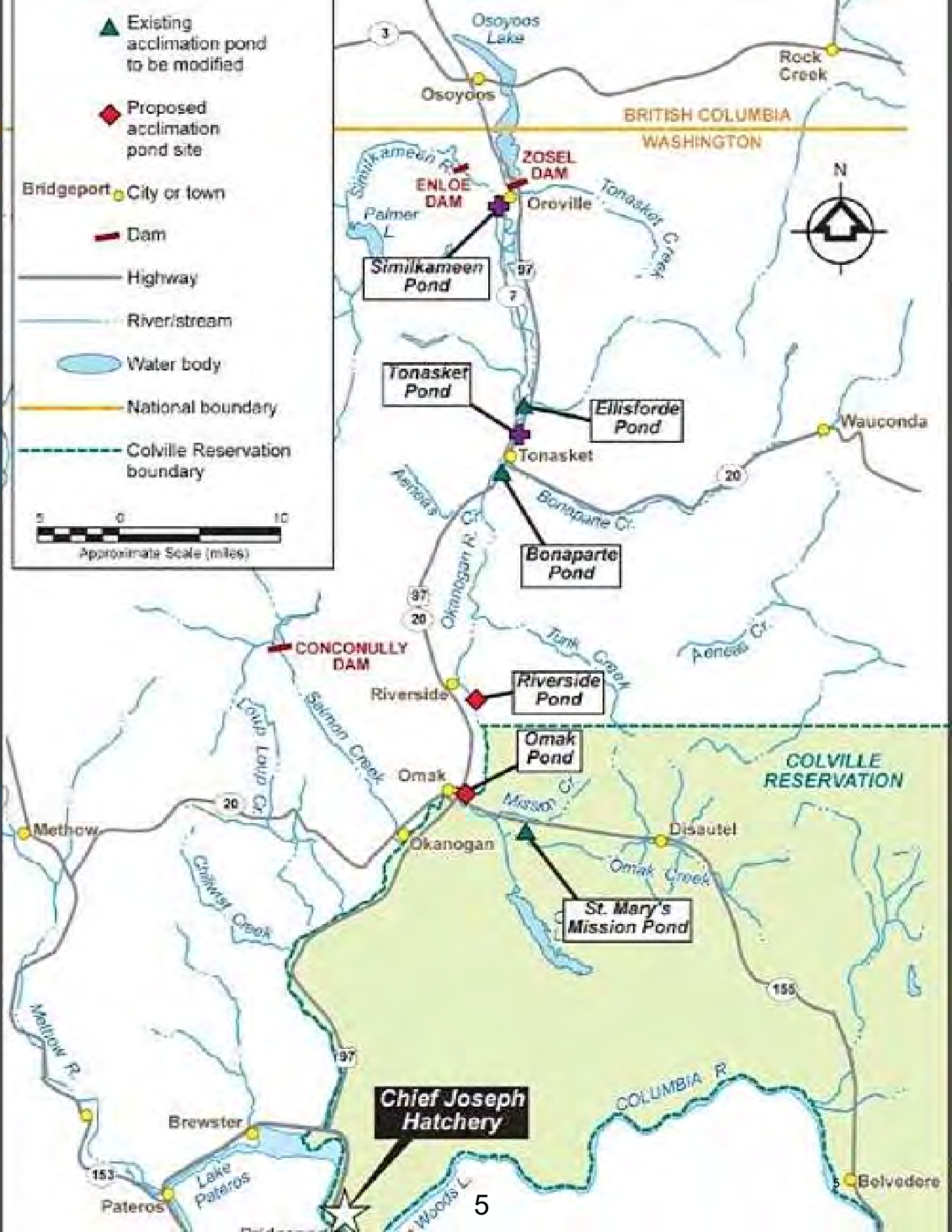
Miles

BONNEVILLE POWER ADMINISTRATION

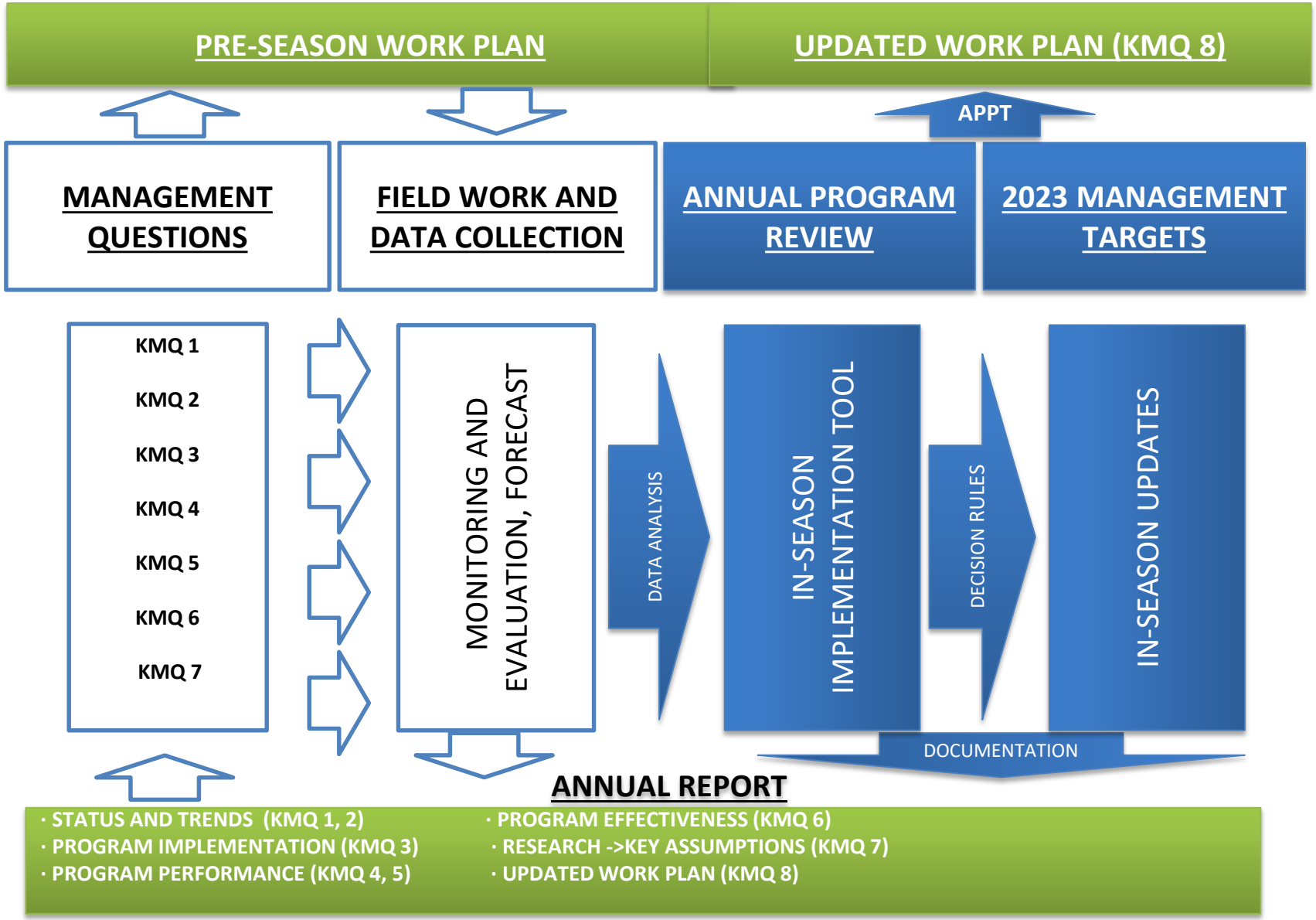
US Army Corps of Engineers®

Map Created: 22 JUN 11

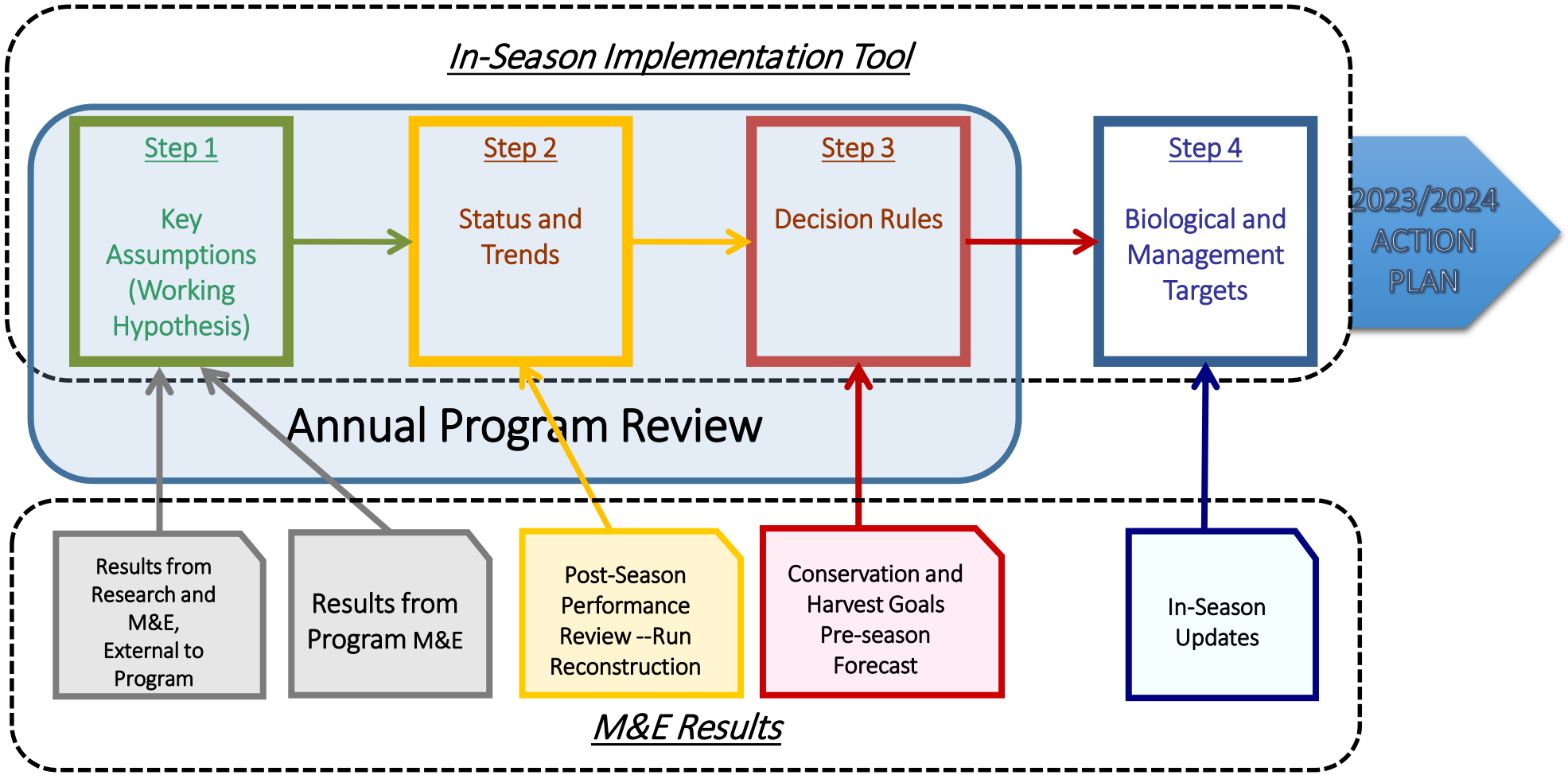
Imagery: © 2010 MDA Information Systems, USGS, NASA


Existing acclimation pond to be modified
Proposed acclimation pond site
Bridgeport City or town
Dam
Highway
River/stream
Water body
National boundary
Colville Reservation boundary
5 0 10
Approximate Scale (miles)
Osoyoos Lake
Osoyoos
Rock Creek
BRITISH COLUMBIA
WASHINGTON
Similkameen R.
ENLOE DAM
ZOSEL DAM
Oroville
Tonasket Creek
Palmer L.
Similkameen Pond
N
Tonasket Pond
Ellisforde Pond
Wauconda
Tonasket
Aeneas Cr.
Bonaparte Cr.
Bonaparte Pond
Okanogan R.
CONCONULLY DAM
Riverside
Riverside Pond
Loup Loup Cr.
Salmon Creek
Omak Pond
Omak
COLVILLE RESERVATION
Methow
Okanogan
Disautel
Chiliwist Creek
St. Mary's Mission Pond
Methow R.
Brewster
Chief Joseph Hatchery
COLUMBIA R.
Lake Pateros
Pateros
Belvedere
Woods L.

Adaptive Management Implemented

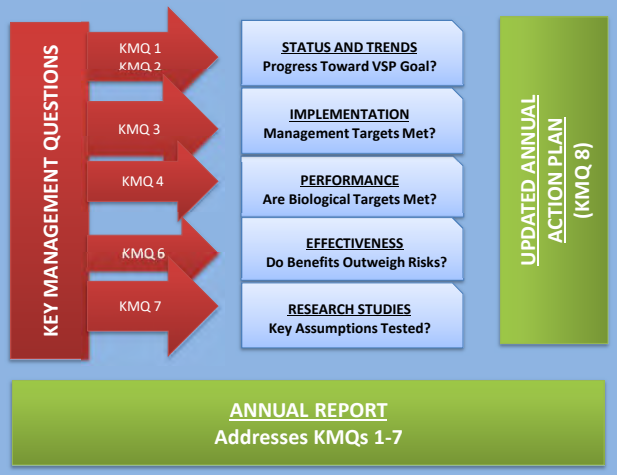


ISIT and the Annual Program Review



Key Management Questions

Status and Trends:	1. What is the current status and recent historical trend of the naturally-spawning population in terms of Viable Salmonid Population (VSP) parameters?
	2. What is the current status and recent historical trend for hatchery returns and harvest?
Implementation:	3. Is the hatchery program meeting target in-hatchery performance standards?
Performance:	4. Are the hatchery post-release targets met for survival and total catch contribution?
	5. Are targets for catch contribution and selectivity for HORs met in Fisheries above Wells Dam?
Effectiveness:	6. Are CJH program benefits consistent with conservation of summer/fall and spring Chinook natural populations?
Research:	7. Are assumptions about natural production potential valid?
Action Plan:	8. How should the program be operated in the coming year (management targets for pNOB, PNI, pHOS)?



R M&E Activities required to answer the Key Management Questions

1. What is the current status and recent historical trend of the naturally-spawning population in terms of Viable Salmonid Population (VSP) parameters?

a. Record/review VSP targets for the affected natural populations.
b. Annual estimates of: spawner abundance, distribution, composition (origin, age, and sex)
c. Annual estimates of: total adult equivalent recruitment of NORs by age (brood year)
d. Annually updated estimates of recruits per spawner
e. Updated estimates of spawner-recruit relationship from empirical observations (a-c)
f. Compare estimates of VSP parameters to their targets (hypothesis test)

2. What is the current status and recent historical trend for hatchery returns and harvest?

a. Annual estimates of: smolt releases by age/size for each hatchery program
b. Annual estimates of: total adult equivalent recruitment of HORs by brood year for each hatchery program
c. Annual contribution to defined fisheries for each hatchery program by brood year

3. Is the hatchery program meeting target in-hatchery performance standards?

a. Record of pre-season targets for broodstock selection, mating protocols, life stage survival, marking and genetic sampling
b. Annual record of number and source of broodstock spawned
c. Record of mating protocols
d. Annual estimates of fecundity by age and broodstock source (NOB, HOB)
e. Annual estimates of survival by life stage for each program and egg lot
f. Record of marking and sampling activities and results
g. Annually updated estimates of: pNOB and smolts per spawner for each hatchery program

4. Are the hatchery post-release targets met for survival and total catch contribution?

a. Record of pre-season targets for SAR, catch contribution by fishery, maximum contribution to non-Okanogan natural spawning, maximum rate of straying to the Okanogan from CJH released fish, minimum return rate of fish released into the Okanogan River.
b. Compare annual estimates from 2. a, b, c to targets in 4.a. View targets as testable hypotheses.

5. Are targets for catch contribution and selectivity for HORs met in Fisheries above Wells Dam?

a. Record of target for harvest of HORs from each hatchery program and maximum harvest related mortality to Okanogan NORs by fishery above Wells Dam
b. Annually estimate catch and harvest related mortality of HORs and NORs by fishery and gear type and compare to targets.

6. Are CJH program benefits consistent with conservation of summer/fall and spring Chinook natural populations?
a. Record of pre-season targets for maximum contribution to non-Okanogan natural spawning, maximum rate of straying to the Okanogan from CJH released fish, minimum return rate of fish released into the Okanogan River.
b. Annually estimate (and compare to targets in 6a) the number of strays from each CJH program to each neighboring population relative to the maximum contribution targets for those populations. View targets as testable hypotheses.
c. Annually estimate (and compare to target in 6a) the contribution of each hatchery program to the Okanogan natural escapement--view target as a testable hypothesis.
d. Annually evaluate whether hatchery contribution rates to natural spawning are meeting or exceeding HSRG standards for pHOS and PNI for all affected populations.
e. Periodically evaluate whether long term targets for conservation and harvest could be met w/o one or more of the hatchery programs.
7. Are assumptions about natural production potential valid?
a. Review/update habitat based natural production potential (EDT)
b. Review/update assumptions about relative reproductive success of hatchery origin spawners in the wild
c. Review/update assumptions about fitness effects of hatchery fish on the naturally spawning population
d. Test theoretical natural production potential (based on EDT and Ford genetic fitness) against observed spawner recruit observations.
8. How should the program be operated in the coming year (management targets for pNOB, PNI, pHOS)?
a. Conduct annual program review (APR)
b. Annually refine runsize forecasting and in-season updating methods
c. Obtain/collect dam counts and other data as prescribed by the forecasting/updating methods
d. Periodically, during the pre-season, update estimated return of Okanogan and CJH origin returns above Wells each year
e. Update annual work plan based on most recent results from the RM&E program and the current run forecast.

Part 2 – Data Analysis and Presentation: 2022 Year-in-Review

Population Status

Status and Trend of Okanogan summer/fall Chinook

Chief Joseph Hatchery
2023 Annual Program Review

Andrea Pearl
Colville Confederated Tribes
Sr. Fisheries Biologist

Grant County PUBLIC UTILITY DISTRICT

P.U.D. CHELAN COUNTY

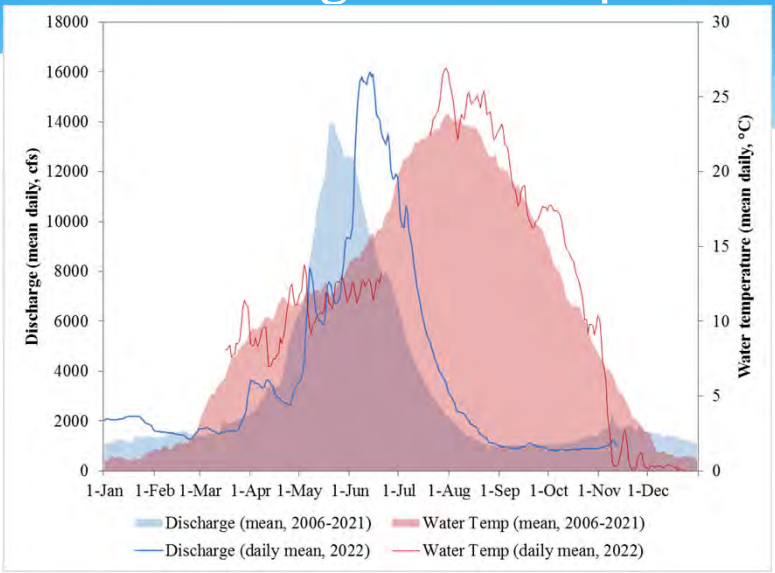
DOUGLAS COUNTY PUD

KMQ 1: What is the current status and recent historical trend of the naturally-spawning population in terms of Viable Salmonid Population (VSP) parameters?

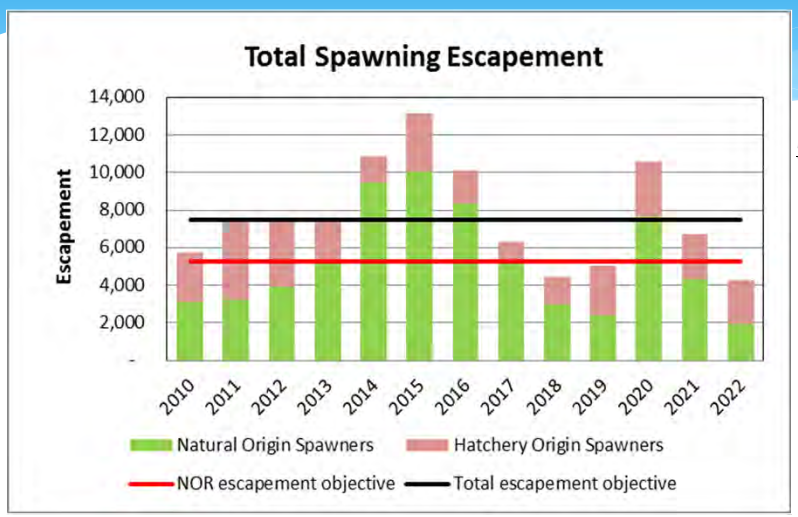
Viable Salmonid Population (VSP)

- Independent of other populations
  (distance, genetics, stray rates, size)
- Negligible risk of extinction
  (less than 5% over 100 yr timeframe)
- Abundance, Productivity, Spatial Structure, Diversity

Water discharge and temperature



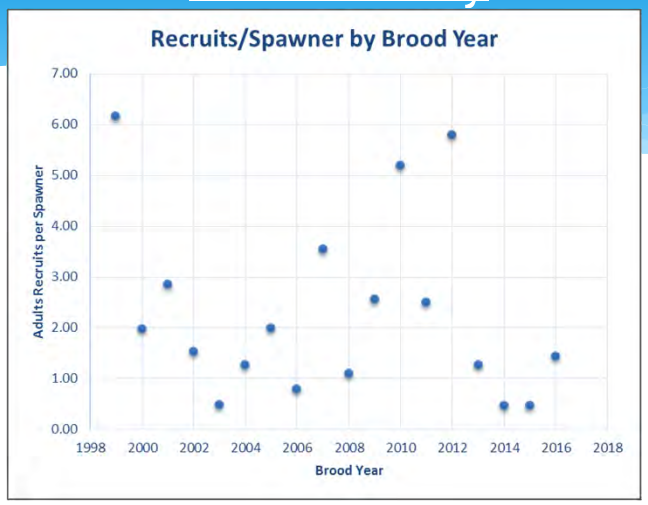
Abundance



5 yr mean
6,624

4,523

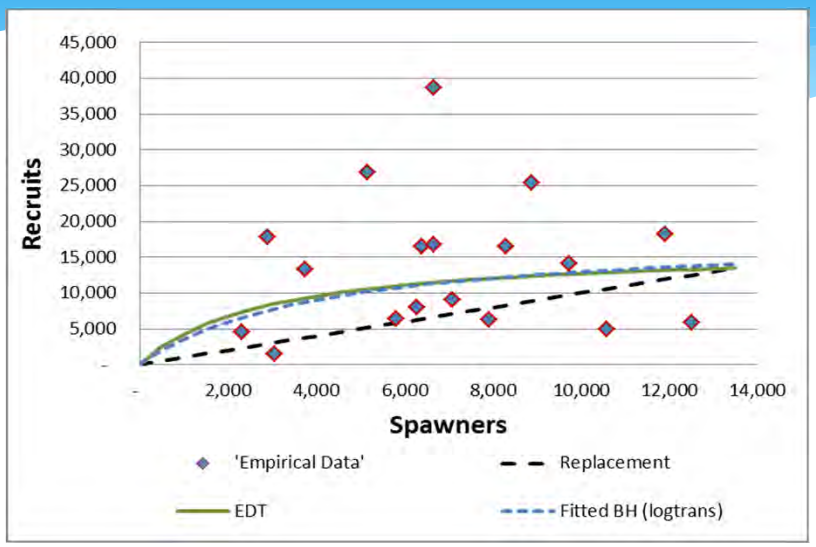
Productivity

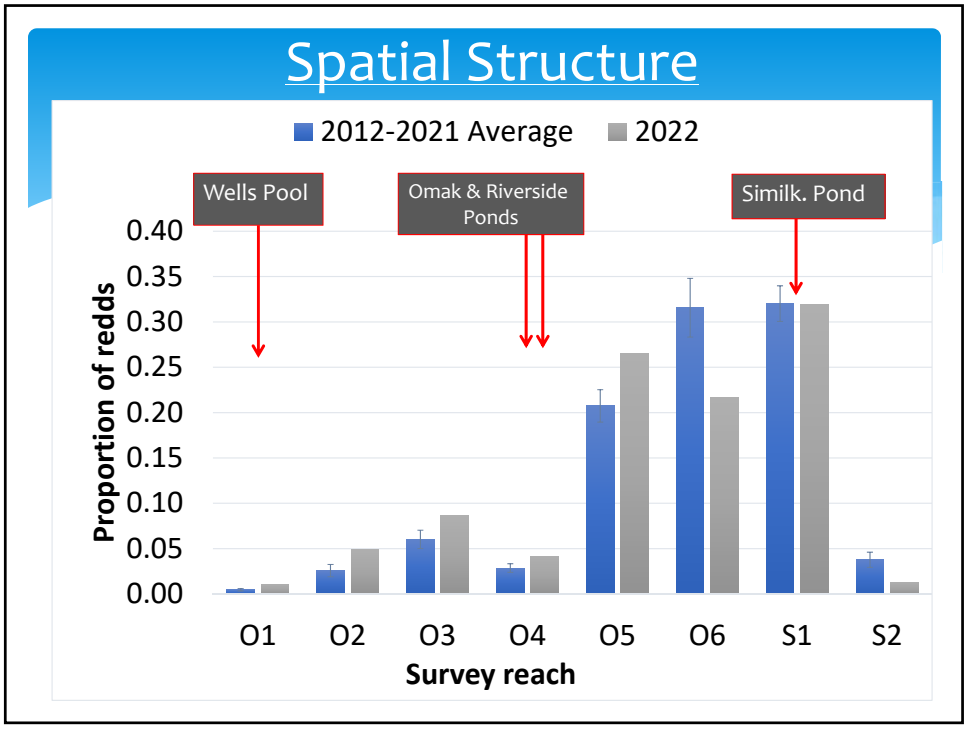


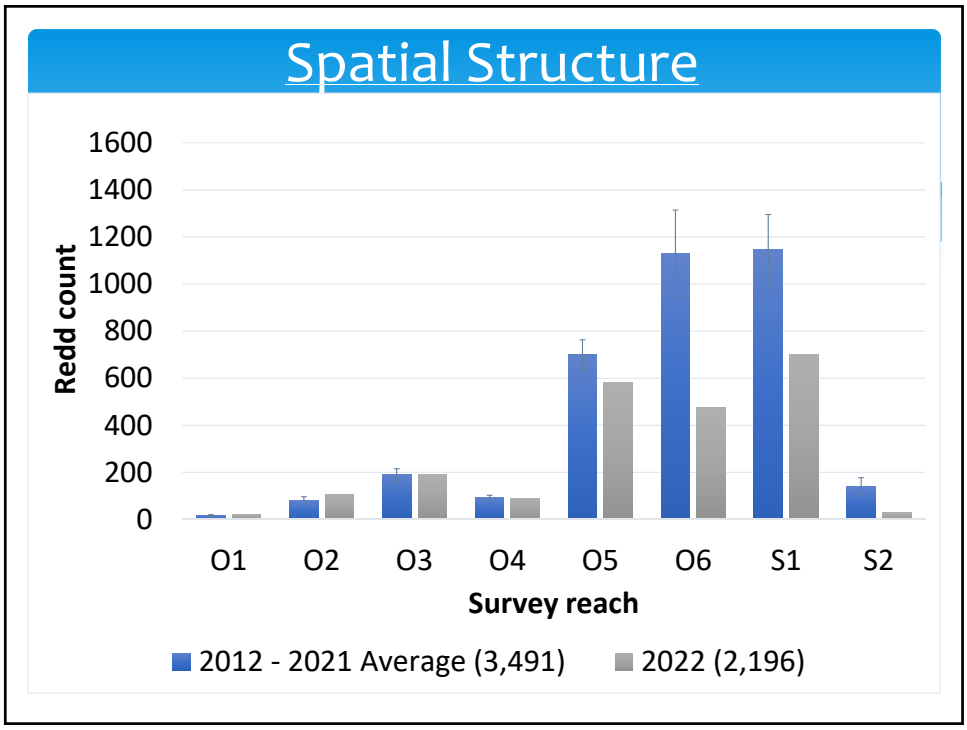
Overall Mean (1999-2016) = 2.3 R/S
10 Yr Mean (2007-2016) = 2.4 R/S
4 of 18 years < 1 R/S

Intrinsic Productivity

(Beverton-Holt modeled = 4.5) BY1999-2016




Spatial Structure
2012-2021 Average
2022
Wells Pool
Omak & Riverside Ponds
Similk. Pond
Proportion of redds
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
O1
O2
O3
O4
O5
O6
S1
S2
Survey reach


Spatial Structure
Redd count
1600
1400
1200
1000
800
600
400
200
0
O1
O2
O3
O4
O5
O6
S1
S2
Survey reach
2012 - 2021 Average (3,491)
2022 (2,196)

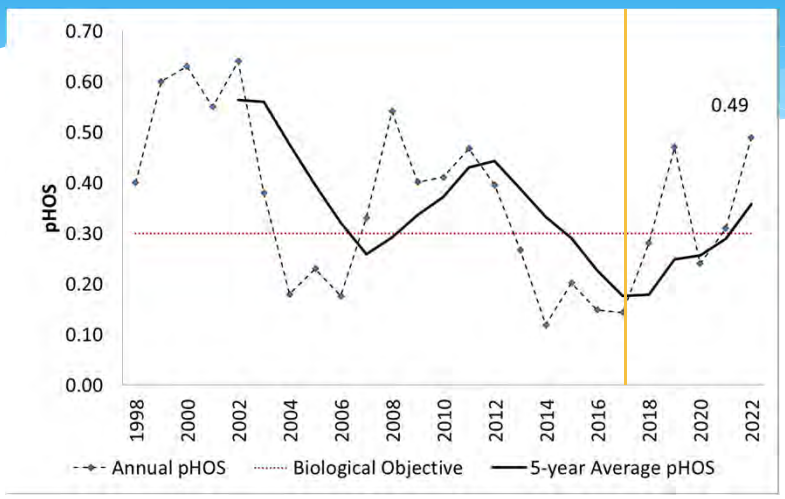
Diversity

Phenotypic (morphology and life history traits)

- Adult run timing
- Spawn timing
- Age structure
- Morphometrics (length, fecundity, others)
- Juvenile rearing strategies
  - Natural yearlings?
  - Transient rearing
  - True subyearling migrants

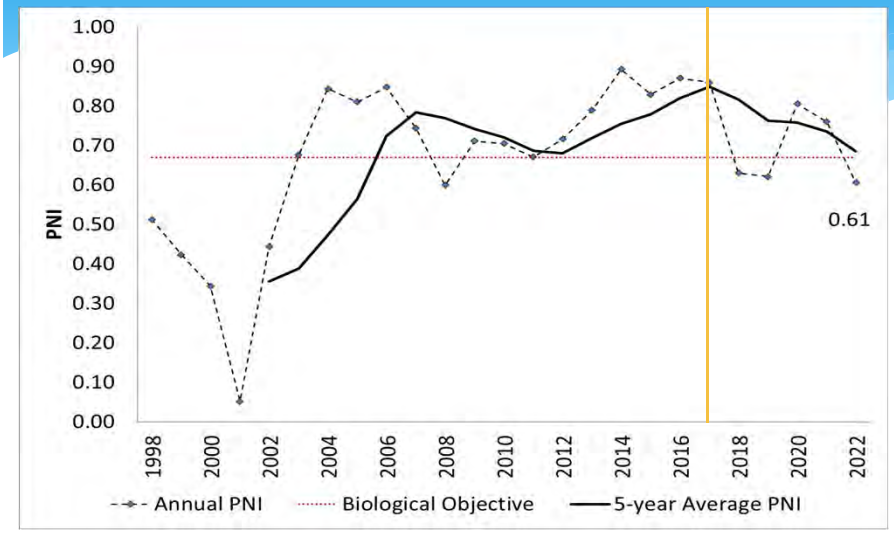
Diversity

Risk factors (spawner composition; pHOS)



Diversity

Risk factors (spawner composition; PNI)



Conclusions

- Abundance: below the objective for total escapement and natural origin spawners and trending down
- Productivity: a bit lower than our EDT assumptions
- Spatial Structure: see a redistribution of upper basin between S1 and O6 but not unusual, increase in the O2 reach below the Malott bridge
- Diversity: Last year we saw pHOS levels just above the objective and we see this again in 2022 but much higher. PNI is still trending down and now below the objective (5-year avg. trending down again)

Part 3 – Review Operating Hypothesis

Management Framework

APR Part 3

Management Framework For Summer/Fall Chinook

- Review Logic Path for the Adaptive Management Process
- Review Key Assumptions
- 2022 Outcomes and 2023 Forecasts

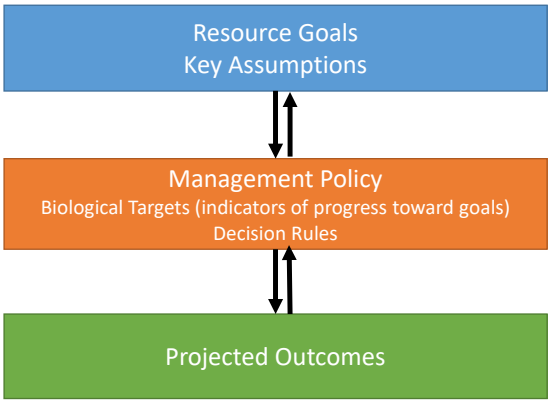
Components of Adaptive Management

I. Annual Program Review
   a. Program Goals (harvest and conservation)
   b. Key Assumptions
   c. Management Policy

Purpose of the APR: Confirm/adjust Key Assumptions and Management Policy to ensure that Program Goals are met over time

II. In-Season Management
   a. Run Forecasts
   b. Management Targets (escapement, harvest, hatchery)

Components of Adaptive Management



Program Goals

- **Conservation or Natural Production Goals:**
  - 7,500 total spawners—5,250 natural origin spawners (NOS)
  - Increase temporal and spatial diversity of spawning/rearing
  - High PNI, low pHOS so that the natural environment is driving adaptation
- **Harvest Goals:**
  - Increase harvest for all fishers
  - Harvest full tribal allocation (2023 pre-season ~ 6,800)
  - Increase % of individual tribal member harvest

Key Assumptions – Natural Production

HABITAT PARAMETERS	2011	2012	2013	2014	2015	2016	2017	2018	5-year average	Current Conditions
Habitat Productivity		7.5			8.9			5.8	NA	5.8
Habitat Capacity		12,499			7,442			16,296	NA	16,296
OCEAN AND PASSAGE SURVIVAL (SAR)										
Juvenile Outmigration										27.0%
Ocean Survival (BON to BON)										1.98%
Adult Migration										83.0%
Smolt-to-Adult Survival (SAR) (OK to OK)									0.63%	0.44%

- Habitat productivity and capacity assumptions based on EDT (last updated in 2016)
- Juvenile outmigration and adult migration assumptions are based on the BiOp
- Ocean survival (BON to BON) assumption is based on 2016 EDT analysis. Empirical data for NORs (based on PIT tag returns) suggests much higher SARs than average for BYs 2011-2013 and much lower SARs for BY 2014-2016. SARs for BY 2017-2019 appear to be closer to the long-term average assumption used in EDT.

Key Assumptions - Harvest

HARVEST RATES-NORs	2018	2019	2020	2021	2022	5-year average
Ocean (unmarked)	23.9%	22.2%	14.4%	18.9%	24.8%	20.5%
Lower Col. Zones 1-5 (unmarked)	0.8%	0.4%	0.8%	0.8%	0.5%	0.6%
Upper Col. Bonneville to Wells (unmarked)	26.8%	18.0%	14.7%	23.0%	20.9%	20.3%
NOR Terminal Induced Mortality Rate	3.0%	3.3%	1.2%	2.9%		3.1%
HARVEST RATES-HORs						
Ocean (marked)	23.9%	22.2%	14.4%	18.9%	24.8%	20.5%
Lower Col. Zones 1-5 (marked)	4.4%	0.4%	2.9%	5.5%	6.3%	2.8%
Upper Col. Bonneville to Wells (marked)	30.6%	30.8%	23.4%	37.4%	35.2%	31.1%
Terminal Above Wells - Integrated	38.1%	34.8%	17.8%	33.7%		29.2%
Terminal above Wells - Segregated	47.9%	56.2%	11.9%	64.3%		31.4%

- TAC harvest rates used for ocean, Zones 1-5, and Upper Columbia to Wells fisheries
- RMIS (based on CWTs) data for terminal harvest of HORs
- NOR terminal harvest rate is estimated using CJHP program data
- Total exploitation rate is 39% for NORs and 62% for Integrated HORs
- Low NOR terminal harvest rate by MSF is critical for brood and escapement
- MSF sport fisheries in Columbia River Zones 1-6 also help NOR returns

Key Assumptions - Hatchery

Integrated Program In-Hatchery Assumptions	5-year average	Planning Assumptions
In-Hatchery Pre-spawning survival - NORs	80.1%	(+) 80.1%
Eggs/Female - NORs	4,015	(-) 4,600
Egg to smolt survival-yearlings	65.6%	(-) 86.0%
Egg to smolt survival-subyearlings	77.8%	(-) 84.0%
Segregated Program In-Hatchery Assumptions	**5-year average**	**Planning Assumptions**
In-Hatchery Pre-spawning survival - HORs	76.2%	(+) 76.2%
Eggs/Female - HORs	3,856	(-) 4,600
Egg to smolt survival-yearlings	75.4%	(-) 86.0%
Egg to smolt survival-subyearlings	82.4%	(-) 84.0%

- 6 of 8 metrics are not meeting expectations (pre-spawning survival assumption was 90%, now based on 5-year average)
- Options: 1) Collect more brood (not without more space or cooler water)

  2) Change management practices (CJH has been doing this, but not the big stuff (i.e. water and space))

  3) Accept the lower biological targets and reduce the program goals for smolts released

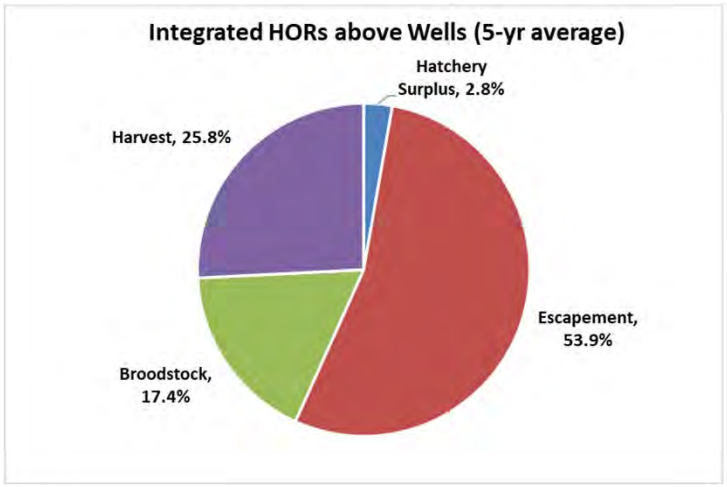
Key Assumptions - Hatchery

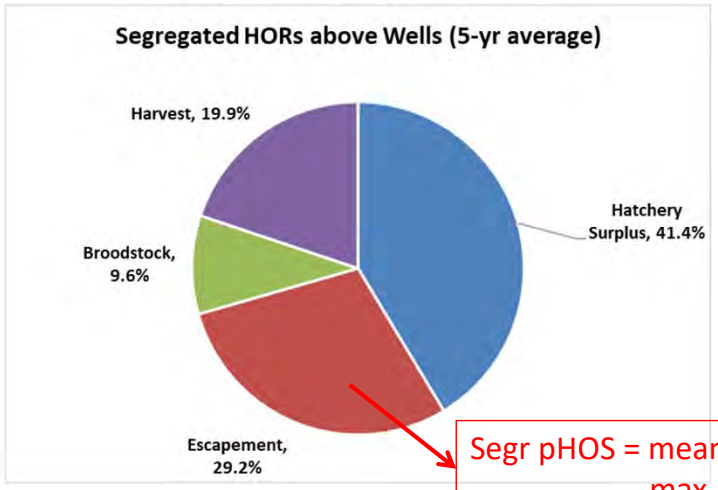
HATCHERY	5-year average	Planning Assumptions
SAR- integrated yearlings - BY	1.33%	0.90%
SAR- integrated subyearlings - BY	0.29%	0.30%
SAR- segregated yearlings - BY	0.99%	0.90%
SAR- segregated subyearlings - BY	0.08%	0.30%

- Yearling SARs have consistently exceeded original program assumption of 0.8-0.9%.
- Integrated subyearling SAR similar to planning assumptions; lower for segr. subyearlings
- Stray rate of CJ HORs (Int and Seg) to other streams and hatcheries is very low.

Key Assumptions – Hatchery

Destination of HORs after passing Wells Dam





Segr pHOS = mean 7.7%
max 17%

- Segregated HOR escapement to the Okanogan River (strays) has been higher than expected, the goal is for the majority of seg HORs to be harvested or return to the hatchery ladder.
- We don't operate the ladder as much as we could, its unclear if ladder operations affect stray rate to the tributaries.

Many segr. summer Chinook are left in the river:

-early on, it's to provide fish for the fishery

-later, it's to avoid steelhead 'take' and rendering at the dump

October 6, 2020

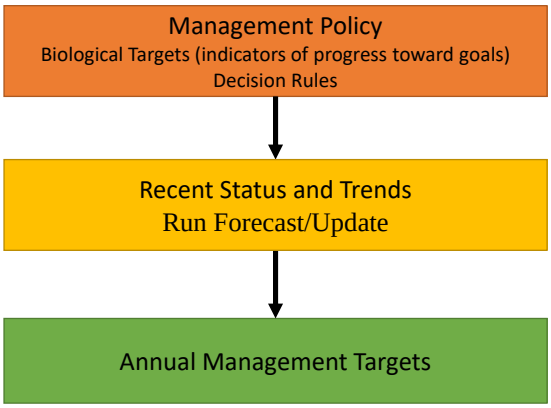
Components of Adaptive Management

I. Annual Program Review

II. In-Season Management Decision Making

II. In-Season Management Decisions

What is the "right thing to do" the coming season to meet Biological Objectives



Biological Targets are indicators of annual progress toward meeting program goals.

- Total pHOS (all programs) < 30%
- Segregated program pHOS <5%
- PNI > 0.67
- Minimum NOS target of 800 to collect brood for the integrated program
- pNOB between 30% and 100%
- Smolt release targets (2.9m ; 6 programs)

Management Targets are annual targets for broodstock collection, harvest, weir removals, etc.

- They are driven by the Run Forecast, Biological Targets and Decision Rules.
- They ensure the best actions are taken given the current run forecast and assumptions about the population.

Run Forecast Methods

1) Preseason forecast (prior to July 15)

1) Columbia River Preseason TAC forecast used to predict Okanogan HORs and NORs based on past relationship between counts at BON and Okanogan/CJHP returns to Wells
2) 2023 pre-season TAC forecast is 84,800
3) TAC will revise in-season and we will adjust

2) In-season run forecast (July 15)

- Wells Dam counts used to predict Okanogan HORs and NORs (regression analyses)

3) Life Cycle Model Forecast

- Forecast returns of Okanogan HORs and NORs using ISIT tool: using empirical data on escapement, hatchery releases, age composition data, and key assumptions (habitat, hatchery, harvest)

4) Predicted HOR returns based on PIT tag expansions

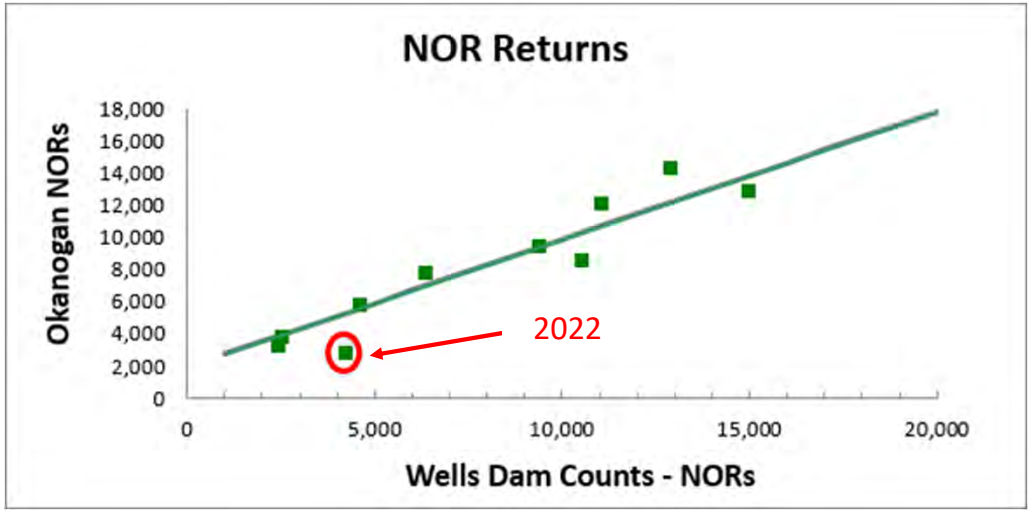
- In-season updates as PITs return to BON and Wells Dam
    - Uncertainty with run-timing can add a lot of variability to this one

Wells Dam Run Forecast and Returns – 2022

2022 Forecasts	Preseason TAC Run Forecast (57,500 to BON)	Life Cycle Model Forecast	Inseason TAC Run Forecast (82,300 to BON)	Forecast Based on 7/15 Wells Dam Counts	PIT Tag Forecast as of 7/15	Final PIT tag forecast	Actual Returns
Okanogan NOR Forecast	5,205	5,827	6,509	5,214	NA	NA	2,755
Okanogan HOR Forecast	3,222	1,991	4,029	3,420	2,307	2,202	3,528
CJH HOR Forecast	1,913	1,576	2,393	2,094	1,743	1,517	991
Total Return Forecast	10,340	9,394	12,931	10,728	4050 HORs	3719 HORs	7,274

- TAC pre-season forecast was very similar to the in-season forecast based on July 15 Wells Dam counts; but none of the methods did a good job of predicting actual NORs.
- This was a tough year for the NOR forecast. Other factors influencing actual returns include pre-spawning mortality (assumption is 10%). Higher PSM than expected would result in fewer actual returns (later we will see that Similkameen was very warm (the warmest ?)
- TAC pre-season forecast and 7/15 Wells forecast did a great job of predicting integrated HORs
- TAC pre-season forecast and 7/15 Wells forecast for segregated HORs were similar; actual returns likely do not account for all seg. HORs due to ladder operations
- 'Actual Returns' are also estimates, with unknown error (creel, redd counts, etc.)

NOR Forecast based on July 15 Wells Dam Counts



Management Targets and Outcomes – 2022

Actuals are based on final Wells Dam run sizes of:
2,755 NORs
3,528 Integrated HORs
991 Segregated HORs

Targets are based on final run forecasts of:
5,214 NORs
2,307 Integrated HORs
1,743 Segregated HORs

	Management Targets	2022 Performance Review Final Targets	2022 Actuals
Harvest	Okanogan HORs retained in Terminal Fisheries	673	654
	CJH HORs retained in Terminal Fisheries	376	181
	Incidental Loss of NORs	178	99
Hatchery and Weir	Return of Okan. HORs to Hatchery	162	59
	Return of CJH HORs to Hatchery	1,094	334
	Okanogan HORs retained at Weir	45	14
	CJH HORs retained at Weir	8	1
Integrated Hatchery Program	Natural Origin Brood (NOB)-Okan (collected)	726	500
	Hatchery Origin Brood (HOB)-Okan (collected)	-	158
	Hatchery Origin Brood (HOB)-CJHP (collected)	-	7
	Projected Annual pNOB-Okan	100%	57%
		800,000 Yearl.	584,716 Yearl.
	Smolt Release-Okanogan	300,000 Subs	0 Subs
Segregated Hatchery Program	Hatch. Origin Brood (HOB) - Int	592	556
	Hatch. Origin Brood (HOB)-Seg (purse seine and ladder)	-	185
		500,000 Yearl.	453,575 Yearl.
	Smolt Release-CJH	400,000 Subs	134,706 Subs
Natural Spawning Escapement	Natural Origin Spawners (NOS)	3,879	1,940
	Hatchery Origin Spawners (HOS) - Int	751	1,878
	Hatchery Origin Spawners (HOS) - Seg	239	255
	Hatchery Origin Spawners (HOS) - out-of-basin	NA	200
	Total Number of Spawners (excludes jacks)	4,869	4,273
	Effective pHOS	17%	49%
	PNI	0.85	0.54

Wells Dam Run Forecast – 2023

2023 Forecasts	Preseason TAC Run Forecast (84,800 to BON)	Life Cycle Model Forecast
Okanogan NOR Forecast	6,904	6,038
Okanogan HOR Forecast	3,743	2,934
CJH HOR Forecast	1,970	1,882
Total Return Forecast	12,618	10,854

- 2023 Preseason TAC estimate for summer Chinook at Bonneville is 84,800 (last year's was 57,500)
- Life Cycle model estimates for 2023 are based on SAR of 2% (NOR), 1.3% (yearling integrated HOR), 0.9% (yearling seg. HOR), and <0.3% for subs.
- Life Cycle model HOR forecasts account for actual hatchery release levels in previous years. Releases were well below average in 2019-2020.

Management Targets for 2023

Based on 2023 preseason TAC forecast, with adjustments to extend to Wells Dam:

6,904 Okanogan NORs
3,743 Integrated HORs
1,970 Segregated HORs

	Management Targets	2023 Targets
Harvest	ogan HORs retained in Terminal Fisheries	1,094
	CJH HORs retained in Terminal Fisheries	618
	Incidental Loss of NORs	229
Hatchery and Weir	Return of Okan. HORs to Hatchery	138
	Return of CJH HORs to Hatchery	1,082
	Okanogan HORs retained at Weir	56
	CJH HORs retained at Weir	6
Integrated Hatchery Program	tural Origin Brood (NOB)-Okan (collected)	699
	hery Origin Brood (HOB)-Okan (collected)	-
	hery Origin Brood (HOB)-CJHP (collected)	-
	Projected Annual pNOB-Okan	100%
		800,000 Yearl.
	Smolt Release-Okanogan	300,000 Subs
Segregated Hatchery Program	Hatch. Origin Brood (HOB) - Int	604
	Brood (HOB)-Seg (purse seine and ladder)	-
		500,000 Yearl.
	Smolt Release-CJH	400,000 Subs
Natural Spawning Escapement	Natural Origin Spawners (NOS)	5,378
	Hatchery Origin Spawners (HOS) - Int	1,666
	Hatchery Origin Spawners (HOS) - Seg	238
	hery Origin Spawners (HOS) - out-of-basin	NA
	otal Number of Spawners (excludes jacks)	7,282
	Effective pHOS	22%
	PNI	0.82

Expected outcomes if 2023 preseason run forecast is correct and management targets are met

STATUS OF BIOLOGICAL INDICATORS (5-year Running Averages)

	Program Biological Targets	Status in 2022 (5-year average)	Projected status in 2023 (based on pre-season TAC forecast)	Projected status in 2023 (5-year average)
NOS	5,250	3,863	5,378	4,345
pHOS	30%	33%	22%	31%
PNI	0.67	0.67	0.82	0.72

Conclusions

- **2022 NOR returns to the basin were well below average, below the preseason TAC forecast and July 15 in-season Wells forecast**
  - Ocean harvest rates for both NORs and HORs were above average; Lower Columbia and Zone 6 harvest rates were above average for HORs
  - PUD count of NORs at Wells on 7/15 slightly below last year, but NOR escapement was <50% of target. This was the first year our 7/15 forecast failed us.
  - As a result of low NOR escapement, did not achieve PNI or pHOS target
  - Challenging to collect enough brood for both integrated and segregated programs
  - ~75% smolt release target (integrated yearling program); >90% for segregated yearling program
  - Zero integrated subyearling releases; ~35% for segregated subyearling program
  - Ocean conditions were moderate for the 2022 outmigrating smolts (9^{th}/23 years) *www.fisheries.noaa.gov/content/ocean-conditions-indicators-trends)*

- **2023 preseason TAC forecast is above average and consistent with LCM for NORs**

  If NORs show up as expected….
  - Aggressive HOR terminal harvest
  - Full brood collection (100% pNOB for integrated program, integr. HORs for segr. program)
  - Expect to meet pHOS and PNI targets; NOR escapement ~5,400 (above goal), total escapement (~7,200) just below the goal, so a few extra integrated fish on the spawning grounds would be good.
  - Overescapement of NORs would be good because the biological targets (5 yr means) are 'recovering' from some down years

Part 4 – Data Analysis and Presentation: 2022 Year-in-Review

Hatchery Program Harvest Surplus

Hatchery Production, Release Numbers, Broodstock Collection

RM&E Summer/ Fall Chinook

RM&E Spring Chinook

2022 Harvest Review & 2023 Forecast

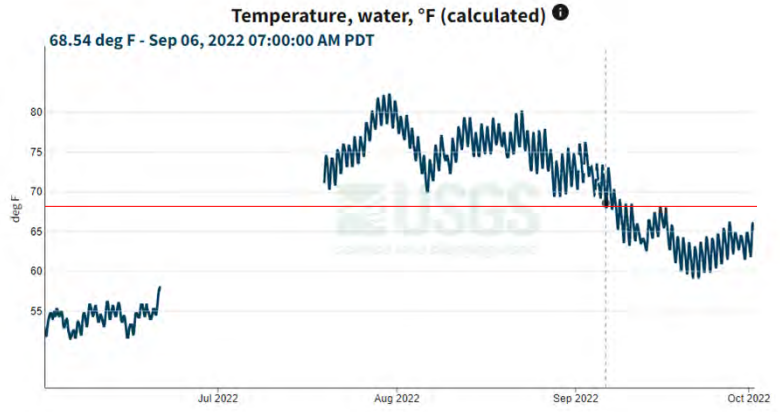
Isaiah Martin Harvest Manager
&
Brian Dietz CJH M&E Biologist

CCT Fish & Wildlife

CCT Harvest Program Goals

- *Collect summer Chinook broodstock for the hatchery: natural-origin (NOR) & hatchery-origin (HOR)*
- *Affect pHOS and improve PNI in summer/fall Chinook spawning areas*
  - *Selectively removing HORs*
  - *Successfully releasing NORs*
- *Provide harvest data to hatchery staff for help in setting the yearly, hatchery-production target*
- *Provide harvest food for subsistence, cultural and ceremonial purposes*

Thermal Barrier



2022 Upper Columbia Summer Chinook Allocations

(All data preliminary and includes kept + release mortalities)

	Pre		Post	
Runsize	56,346		78,444	
Harvest allocated	Allowed		Actual	Actual/
Fishery	Pre	Post	Take	Allowed
PFMC Ocean Fisheries	7,880	7,880	*7,880*	100%
Below Priest Rapids Dam (PRD)	*22.7%*	*35.7%*	*33.5%*	
Commercial below BON	361	1,159	65	6%
Recreational Below Bonneville	1,074	3,449	3,549	103%
Recreational BON to PRD	190	609	302	50%
unallocated	180	580	n/a	n/a
Below PRD Total	1,805	5,796	3,916	68%
Above Priest Rapids Dam (PRD)	*77.3%*	*64.3%*	*66.5%*	
Wanapum Tribal	94	314	19	6%
Colville Tribal	3,075	5,745	1,202	21%
Recreational above PRD	2,981	4,386	6,561	150%
Above PRD Total	6,150	10,445	7,782	75%
Non-Treaty Total	**15,835**	**24,122**	**19,578**	**81%**

Activity	Summer/Fall Chinook									
	Ad Present Adult Broodfish	Ad Absent Adult Broodfish	Ad Present Adults Released [1/]	Ad PresentAdults Retained/Morts	Ad Present Jacks Released [1/]	Ad Present Jacks Retained/Morts	Ad Absent Adults Retained/Morts	Ad Absent Adults Released [1/]	Ad Absent Jacks Retained	Total Adults Removed
CCT F&W Purse Seine	265	516	0	0	25	0	0	5	45	781
Tribal Member Alt Fishery [3/]	0	0	0	0	0	0	0	0	0	0
CJD Tailrace Fishery (expanded; includes snag, dip net and hook and line effort and a calculated release mortality) **4**[/]	0	0	14	215	0	0	969	96	47	1,184
CCT F&W Okanogan Weir	43	13	1	3	1	0	15	0	1	74
Chief Joseph Hatchery Ladder	**90**	**174**	0	0	0	0	743	699	307	1,007
Sub-total Fish Released	**0**	**0**	**15**	**0**	**26**	**0**	**0**	**800**	**0**	**0**
Adult Non Tailrace Release Mortality	**0**	**0**	**0.01**	**0**	**0.01**	**0**	**0**	**7**	**0**	**7**
Total Adult Fish Removed	**398**	**703**	**0.0**	**218**	**0.0**	**0**	**1,727**	**7**	**400**	**3,053**
Grand Total of Adult Fish Removed	**CHK Broodstock** → **1,101**				**CHK Harvest** → **1,184**				**CHK Surplus** → **750**	

Sockeye		Steelhead				Coho	
Sockeye Harvested/Morts	Sockeye Released	Ad Present Released [2/]	Ad Absent Released	Ad Present Harvest	Ad Absent Harvest	Released	Harvested
9,331	1,411	1	0	0	0	0	0
0	0	0	0	0.0	0.0	0	0
474	0	0	0	31	60	0	0
128	9	0	4	0	0	0	0
0	0	0	0	0	0	0	0
0	**1,420**	**1**	**4**	**0**	**0**	**0**	**0**
0	**14**	**0.01**	**0.04**	**0**	**0**	**0.0**	**0**
9,933	**14**	**0.0**	**0.0**	**31**	**60**	**0**	**0**
Sockeye		**Steelhead**				**Coho**	
9,947		**91**				**0.0**	

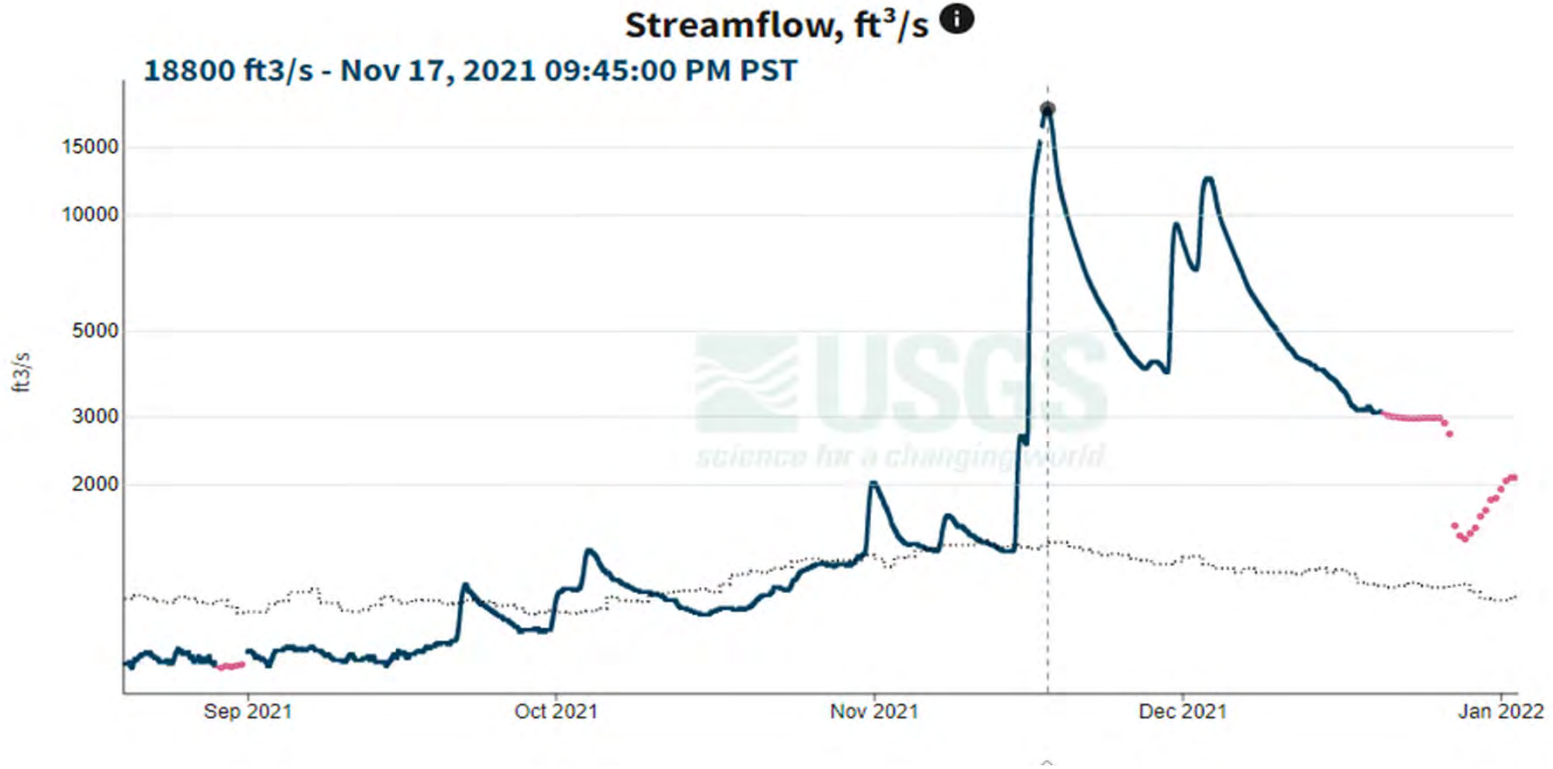
Collection Data

2021 Purse Seine fishing effort

HOR brood collected	516
NOR brood collected	265
NOR Chinook released	0
HOR Released	5
HOR Harvested	0
Sockeye harvested	9,947
Sockeye released	1,420

	Ad Present Adult Broodfish (CJH) [1/]	Leavenworth NFH Brood [2/]	Ad Present Adults Released	Ad Present Adults Harvested/Morts	Ad Present Jacks Released	Ad Present Jacks Harvested/ Morts	10J Harvest	10J Adult Released	10J Jack Released	Ad Absent Adults Harvested/Morts	Ad Absent Adults Released	Ad Absent Jacks Harvested	Ad Absent Jacks Released	SubTotal Harvest - Chinook Adults Only
Chief Joseph Dam, Creel (June 29 - June 30) Expanded with calculated release mortality. Includes 10J proportion	—	—	Ceremonial Only CJH Spring Chinook Fishery in 2022											—
Chief Joseph Hatchery Ladder Surplus	38	591	0	0	0	0	0	0	0	0	0	0	0	**0.0**
Icicle Creel (May 12-June 30) 3/	0	0		21.0		23				1,308		123		**1,329.0**
Post Release Mortality	0	0	0	0	0.00	0.0	0	0	0	0	0.0	0	0	**0.0**
Sub Total of Adult Fish Handled	**38**	**591**	**0.0**	**21.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1,308.0**	**0.0**	**0.0**	**0.0**	**1,329.0**
Grand Total of NOR Handling Mortality	**0**	**0**	0.0	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—
Adult Harvest Total Counted Towards Allocation	**0**	**0**	**Spring Chinook Harvest 0.0**											
Spring Chinook Adults Removed from the System			**1,329.0**											

2021 Fall Blowout



Wells Pool Draw Down Timing

2023 Summer Fall Chinook Forecast

Columbia River Run to Mouth: 84,800

CTCR Draft Allocation: 6,870 - 7,109 (PFMC)

Numbers include ocean Harvest

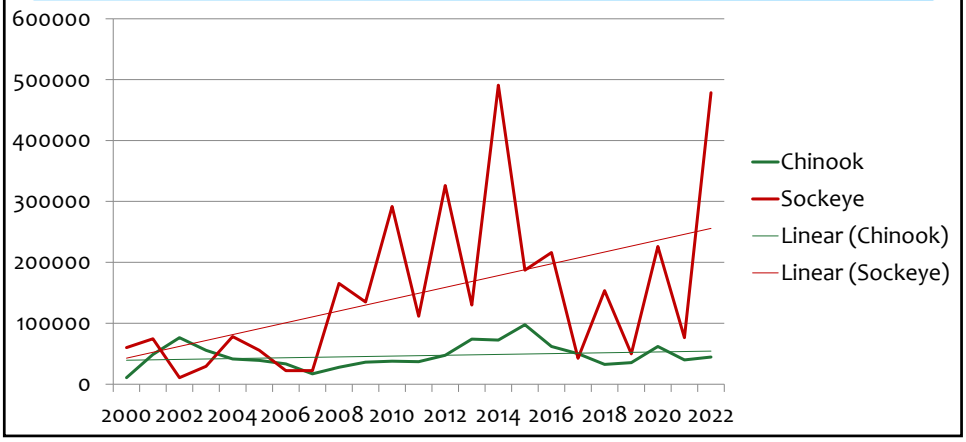
Sockeye Return Forecast

Sockeye Run at Columbia River Mouth: 234,500

Of those, 187,400 are estimated to be Ok origin

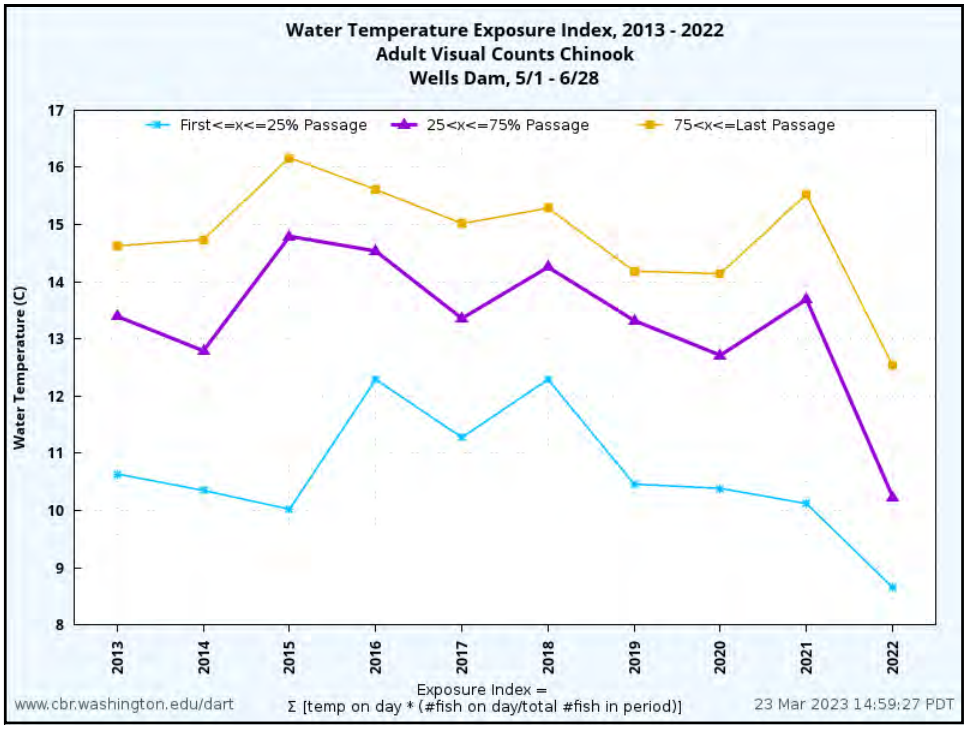
CCT Allocation = Excess of Escapement

Summer Chinook and Sockeye Over Wells Dam Since 2000

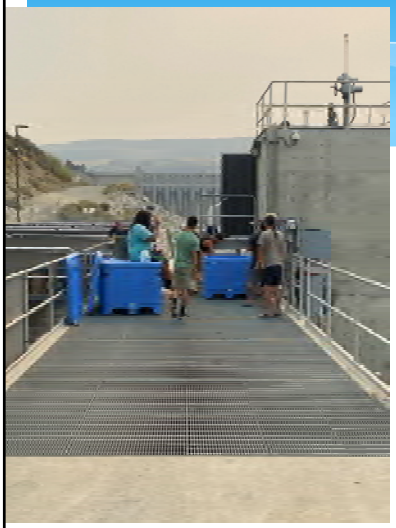


Springer Expectations

* 2023 forecasts 41,400 adults to the upper Columbia River
* Estimated adults to Chief Joseph Hatchery: 4,560
* Estimated adults to Okanogan River: 116
* 29,605 adults returned to upper the Columbia River in 2022



Surplus



11 Surplus events at 4 different hatcheries

Distributed:

2,348 Chinook

5,837 Sockeye

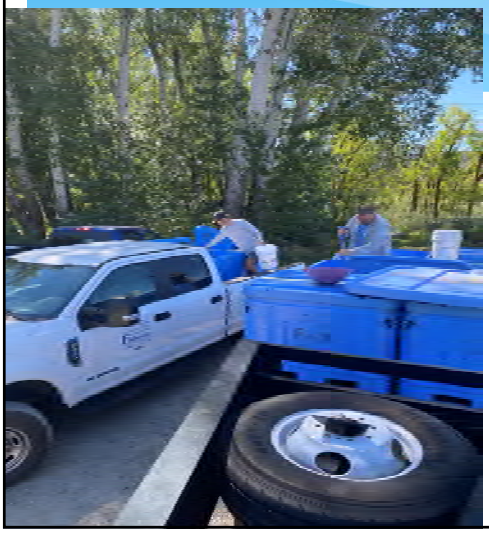
Salmon Storage

1,552 Chinook into Fillets

3,494 Sockeye Frozen Whole

Sturgeon

Ungulates and Trades



Deer

Elk

Moose

Buffalo

Coded Wire Tag Analysis (CWT)

* Creel Harvest
* Ladder Surplus
* Purse Seine Harvest

CJD Creel - Tailrace Harvest

* July 1st – October

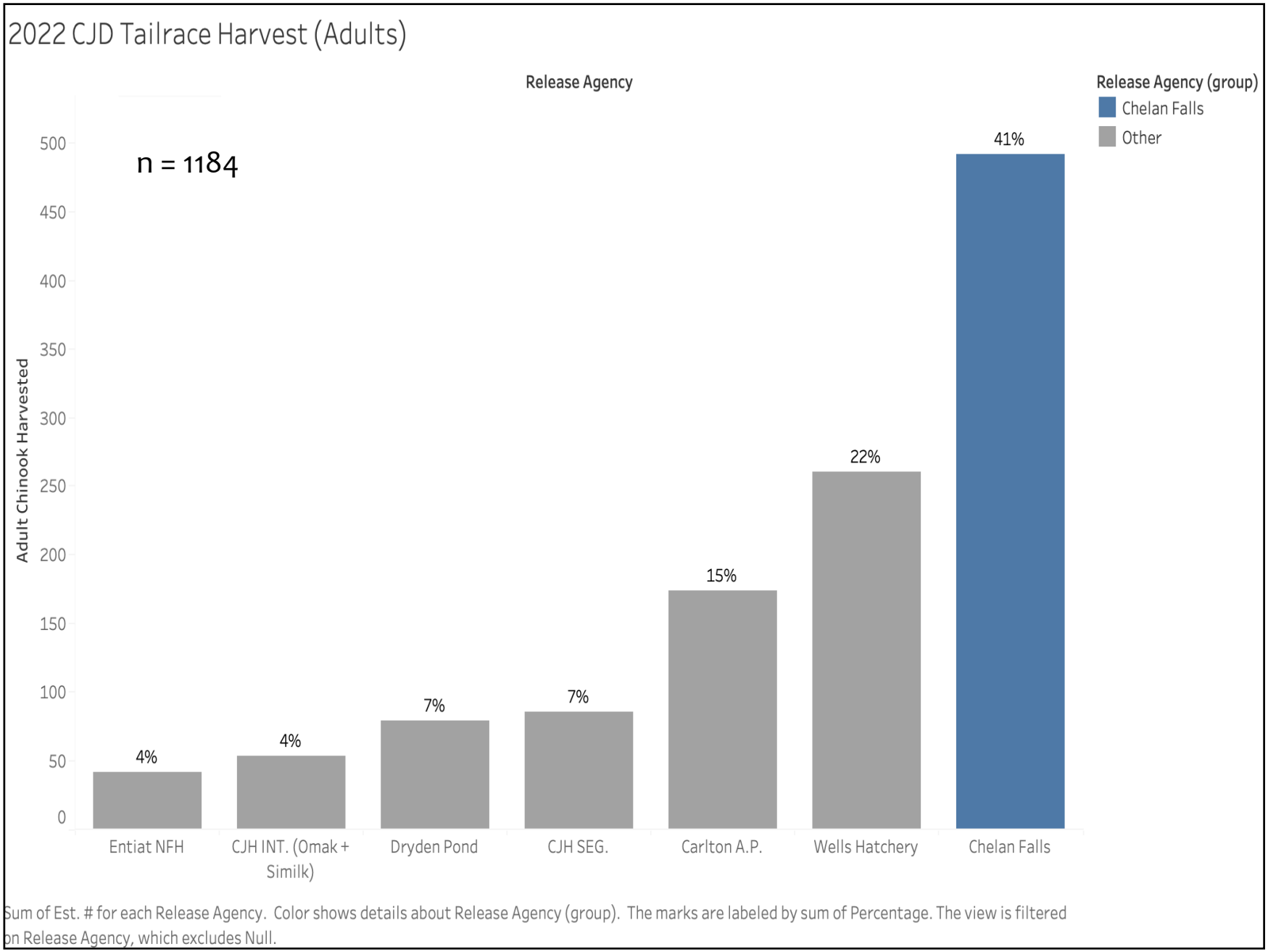
* Effort Hours

1. Snag – 7,097 hours
2. Hook and line – 644 hours
3. Dip Net – 71 hours

Age: (Years)

3	4	5	6
3%	63%	31%	3%

* 2,114 Bank Observations, 610 Interviews conducted


2022 CJD Tailrace Harvest (Adults)
Release Agency
Release Agency (group)
Chelan Falls
Other
n = 1184
Adult Chinook Harvested
500
450
400
350
300
250
200
150
100
50
0
4%
4%
7%
7%
15%
22%
41%
Entiat NFH
CJH INT. (Omak + Similk)
Dryden Pond
CJH SEG.
Carlton A.P.
Wells Hatchery
Chelan Falls
Sum of Est. # for each Release Agency. Color shows details about Release Agency (group). The marks are labeled by sum of Percentage. The view is filtered on Release Agency, which excludes Null.

Ladder Surplus

* 3 – Ladder Surplus Events Throughout August

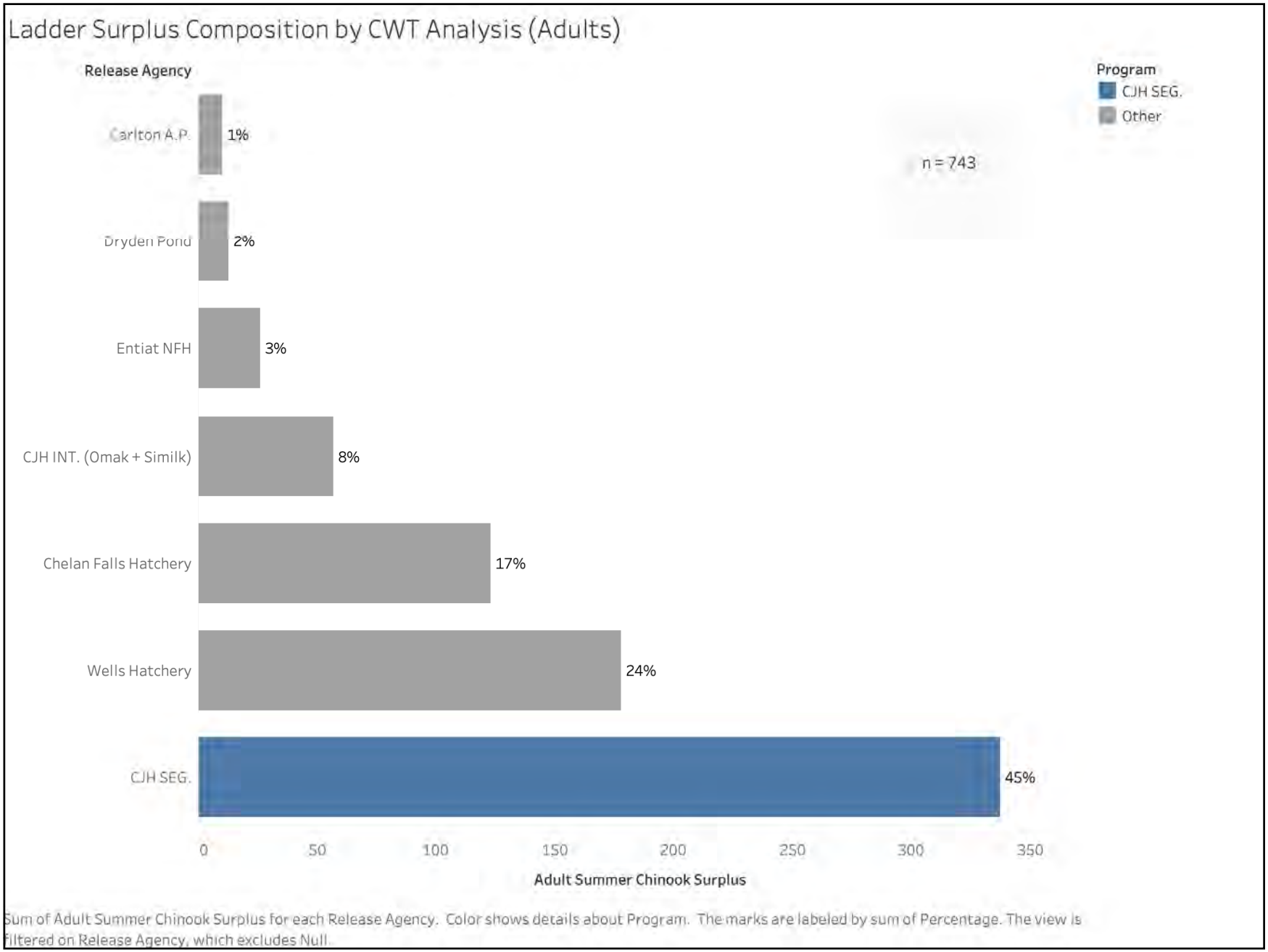
  8/18, 8/25, 8/31

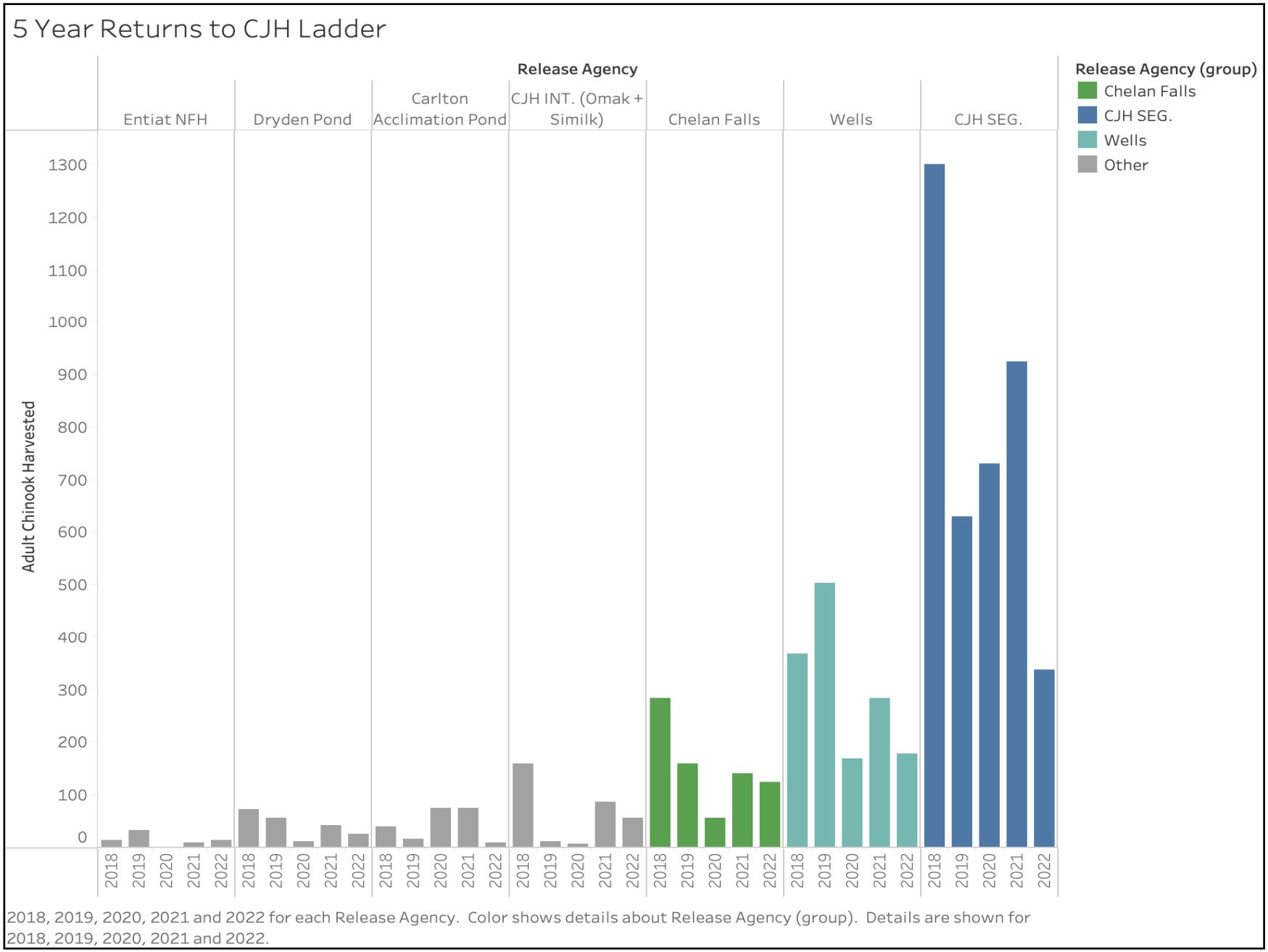
Surplus Totals:

* 743 adipose- clip Adults
* 307 adipose – clip Jacks

Adult Ladder Age (Years)

3	4	5	6
11%	73%	15%	1%


Ladder Surplus Composition by CWT Analysis (Adults)
Release Agency
Program
CJH SEG.
Other
n = 743
Carlton A.P.
1%
Dryden Pond
2%
Entiat NFH
3%
CJH INT. (Omak + Similk)
8%
Chelan Falls Hatchery
17%
Wells Hatchery
24%
CJH SEG.
45%
0
50
100
150
200
250
300
350
Adult Summer Chinook Surplus
Sum of Adult Summer Chinook Surplus for each Release Agency. Color shows details about Program. The marks are labeled by sum of Percentage. The view is filtered on Release Agency, which excludes Null.

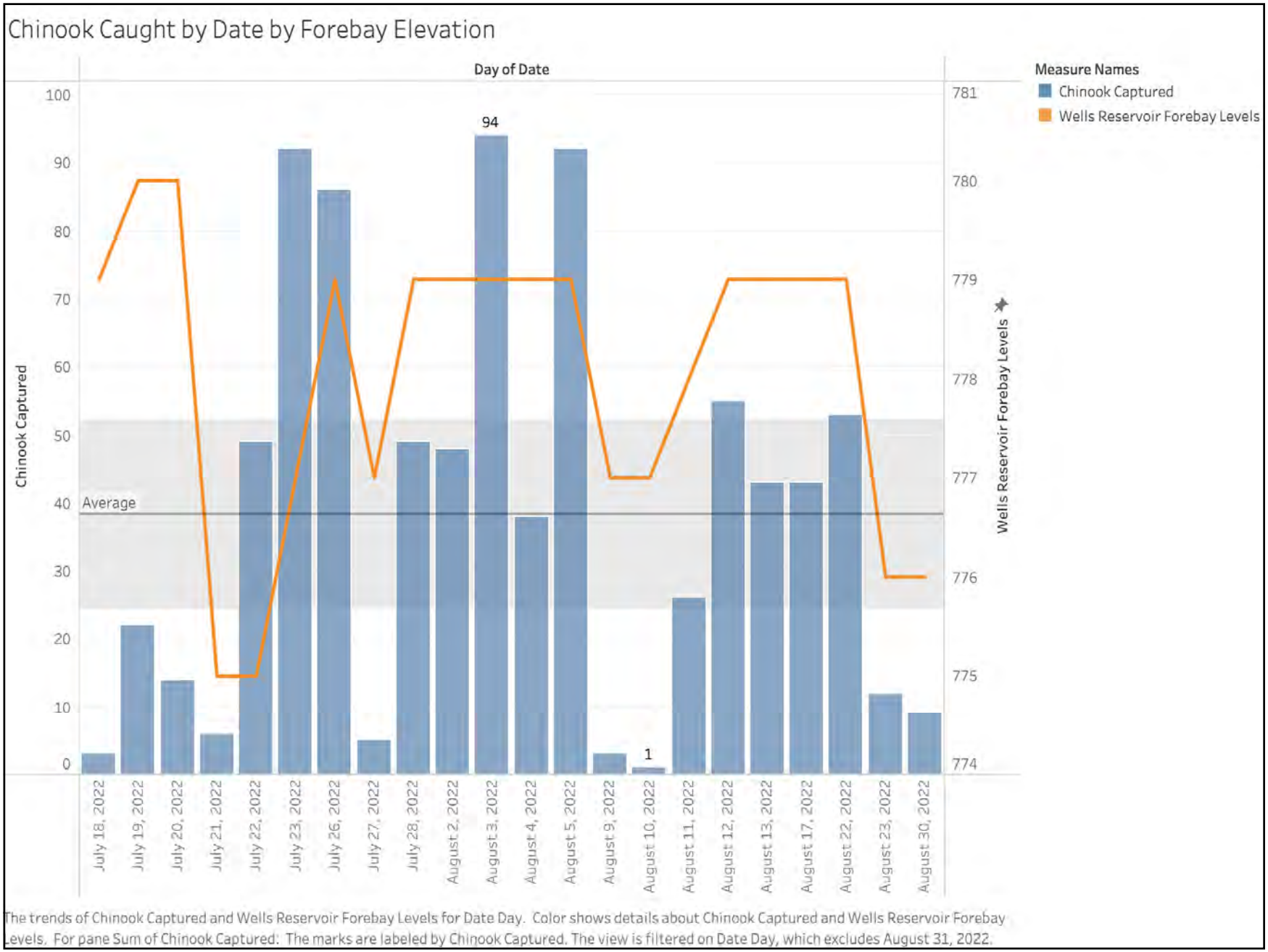

5 Year Returns to CJH Ladder
Release Agency
Entiat NFH
Dryden Pond
Carlton Acclimation Pond
CJH INT. (Omak + Similk)
Chelan Falls
Wells
CJH SEG.
Release Agency (group)
Chelan Falls
CJH SEG.
Wells
Other
Adult Chinook Harvested
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
2018
2019
2020
2021
2022
2018, 2019, 2020, 2021 and 2022 for each Release Agency. Color shows details about Release Agency (group). Details are shown for 2018, 2019, 2020, 2021 and 2022.

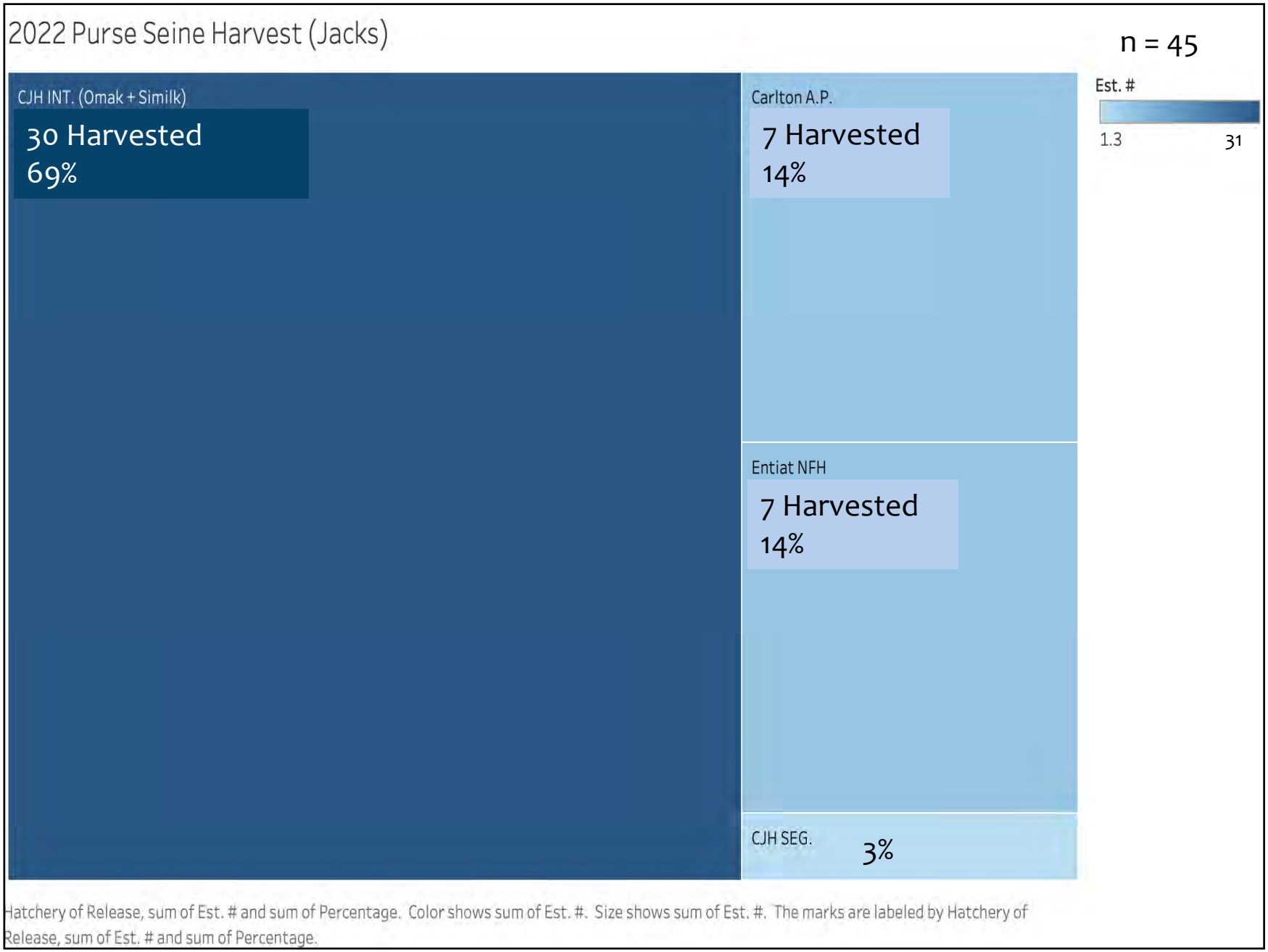
Purse Seine Effort

* 101 Sets

* CPUE (all Salmonids) : 121/set
* CPUE (Sockeye) : 113/set

* CPUE (Chinook): 8/set


Chinook Caught by Date by Forebay Elevation
Day of Date
Measure Names
Chinook Captured
Wells Reservoir Forebay Levels
Chinook Captured
Wells Reservoir Forebay Levels
Average
94
1
100
90
80
70
60
50
40
30
20
10
0
781
780
779
778
777
776
775
774
July 18, 2022
July 19, 2022
July 20, 2022
July 21, 2022
July 22, 2022
July 23, 2022
July 26, 2022
July 27, 2022
July 28, 2022
August 2, 2022
August 3, 2022
August 4, 2022
August 5, 2022
August 9, 2022
August 10, 2022
August 11, 2022
August 12, 2022
August 13, 2022
August 17, 2022
August 22, 2022
August 23, 2022
August 30, 2022
The trends of Chinook Captured and Wells Reservoir Forebay Levels for Date Day. Color shows details about Chinook Captured and Wells Reservoir Forebay Levels. For pane Sum of Chinook Captured: The marks are labeled by Chinook Captured. The view is filtered on Date Day, which excludes August 31, 2022.


2022 Purse Seine Harvest (Jacks)
n = 45
CJH INT. (Omak + Similk)
30 Harvested
69%
Carlton A.P.
7 Harvested
14%
Entiat NFH
7 Harvested
14%
CJH SEG.
3%
Est. #
1.3
31
Hatchery of Release, sum of Est. # and sum of Percentage. Color shows sum of Est. #. Size shows sum of Est. #. The marks are labeled by Hatchery of Release, sum of Est. # and sum of Percentage.

Questions?

Colville Confederated Tribes
Chief Joseph Hatchery
2023 APR Production Update

Colville Tribes Fish & Wildlife

Presenters

Matt McDaniel – CJH Manager

Casey Baldwin – Sr. Research Scientist

Contributors

Jim Andrews – Assistant Manager

Tony Cleveland – Acclimation Ponds Lead

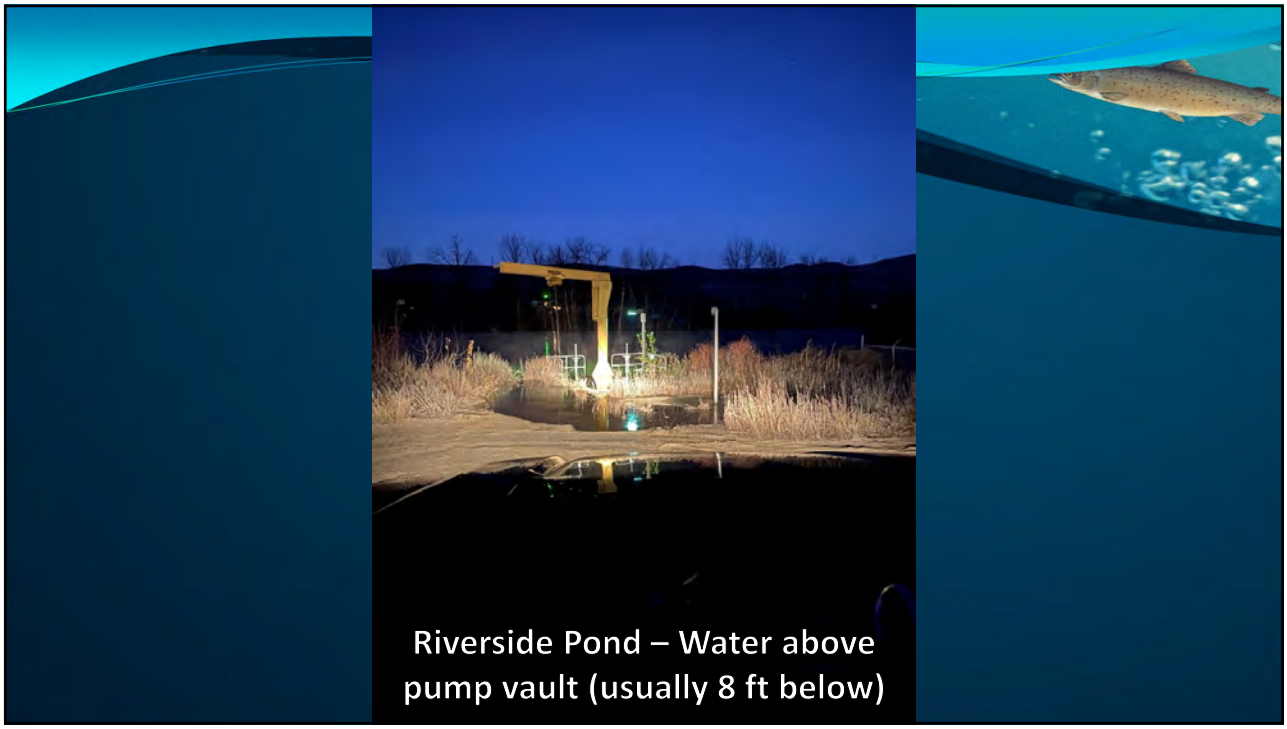
Brian Dietz – Biologist

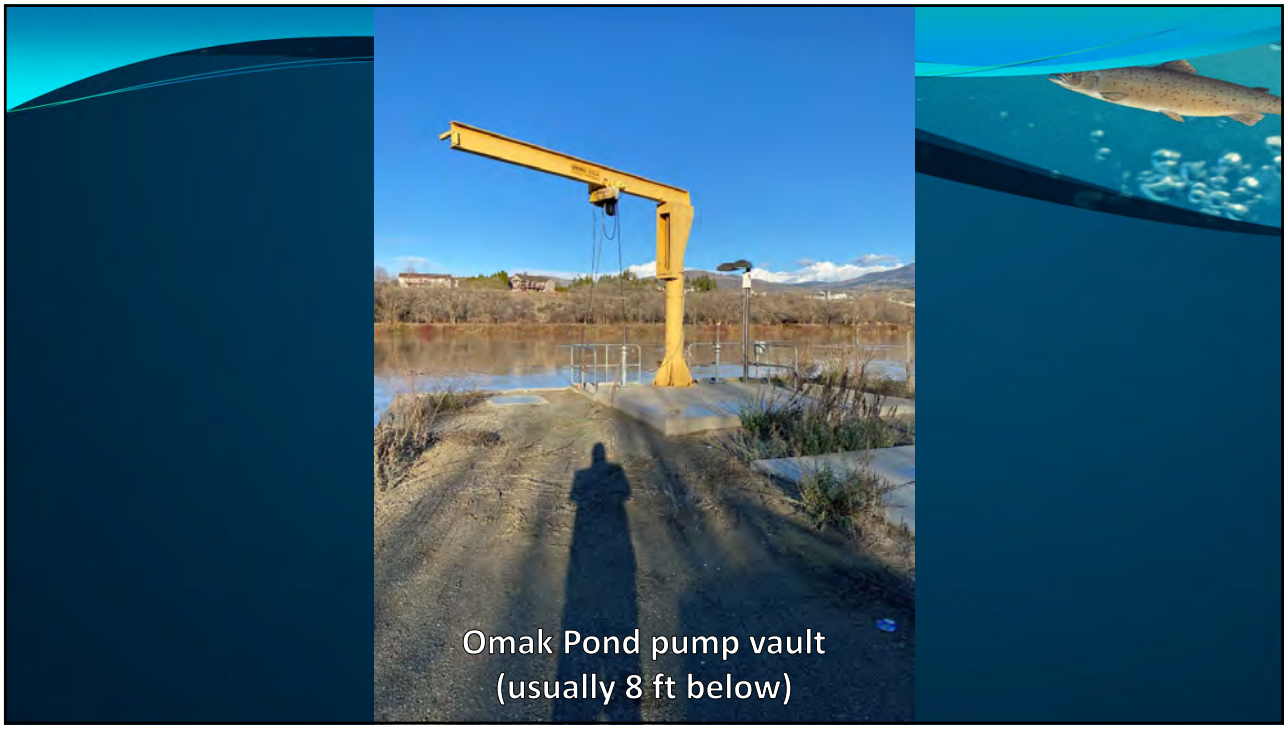
Andrea Pearl – Sr. Biologist

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	CJH (Columbia R.)	Forced	10.0	453,575	500,000
			SUBTOTAL:			**1,048,291**	**1.3 M**
Integrated Sub-yearling	2021	N/A	Omak AP (Okanogan R.)	N/A	N/A	0	300,000
Segregated Sub-yearling	2021	6/8/22	CJH (Columbia R.)	Forced	47.0	134,706	400,000
			SUBTOTAL:			**134,706**	**700,000**
			GRAND TOTAL:			**1,182,997**	**2.0 M**

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


Riverside Pond – Water above
pump vault (usually 8 ft below)


Omak Pond pump vault
(usually 8 ft below)

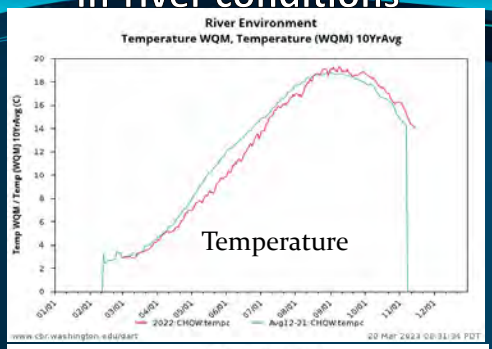

Muddy water at Omak Pond

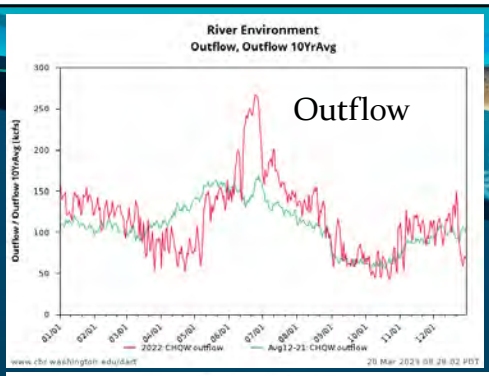

Mud build up at Omak Pond after only a month of rearing.

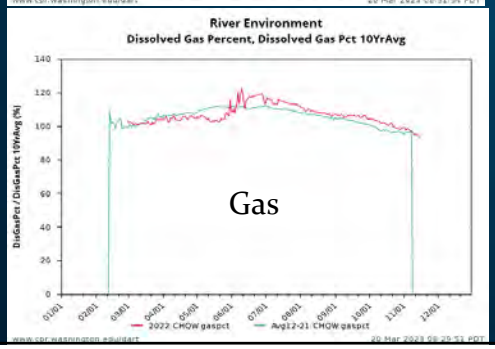
KQM 4: Are the hatchery post-release targets met for survival?

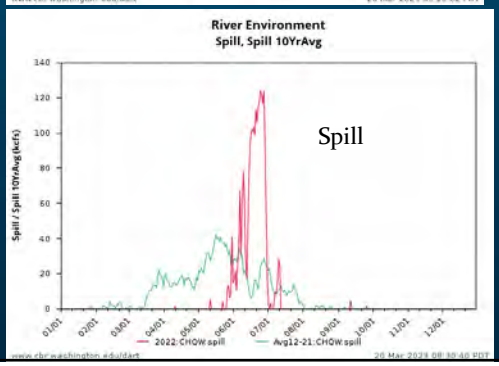
Methods: PIT tag mark-recapture using CJS model on DART

In-river conditions



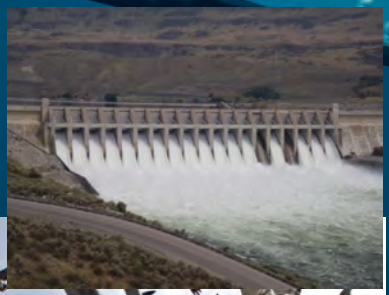


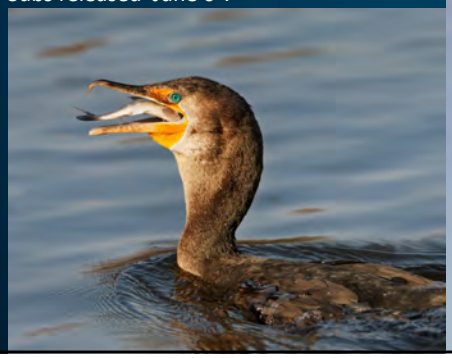




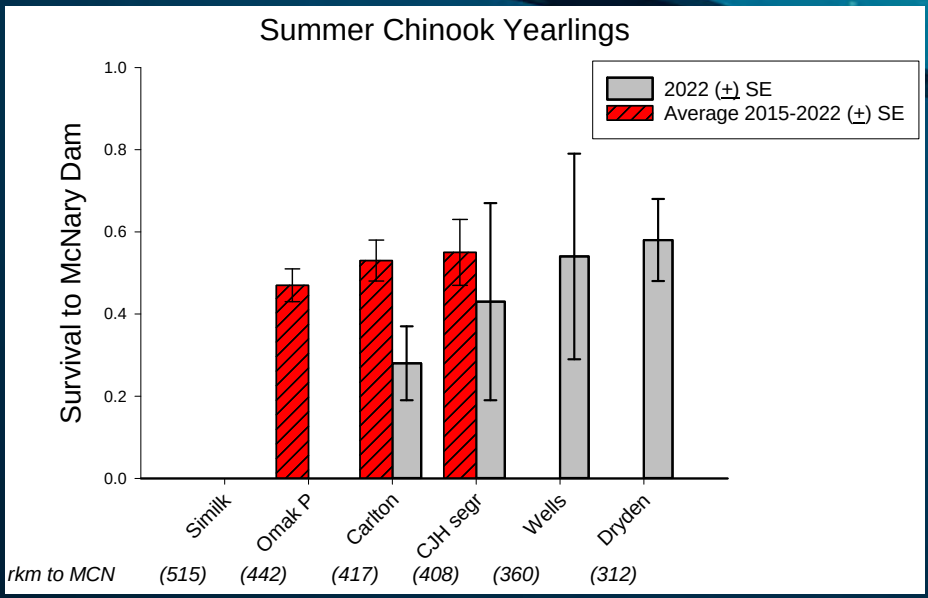
Management Practices

- 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

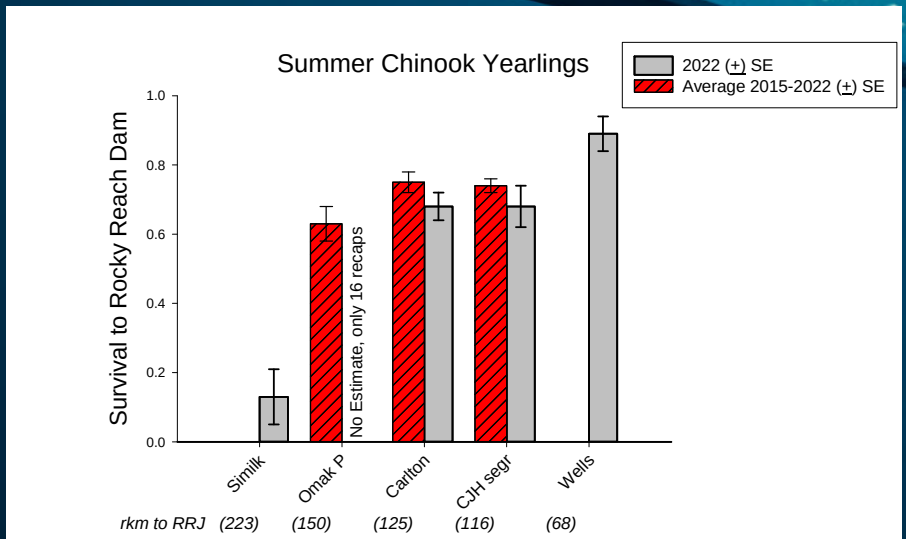




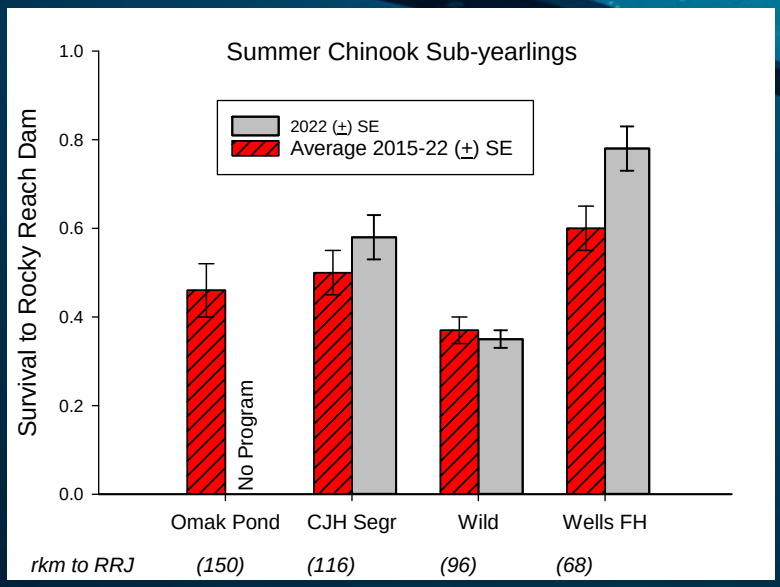
Survival to McNary Dam



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 CJH 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

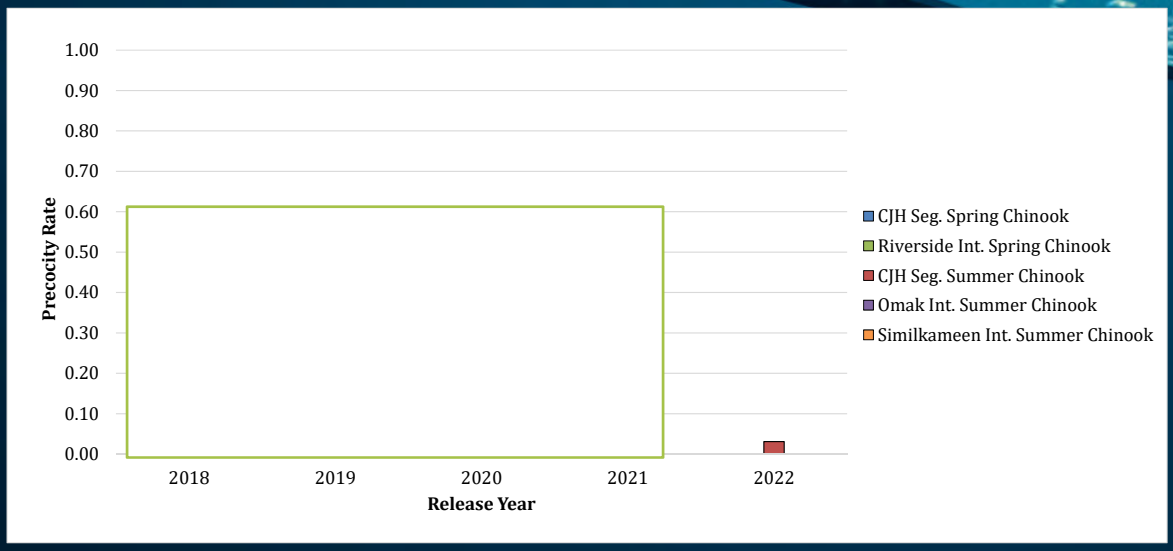
Gonadosomatic Index (GSI) Sampling

- 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 Log10 (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?

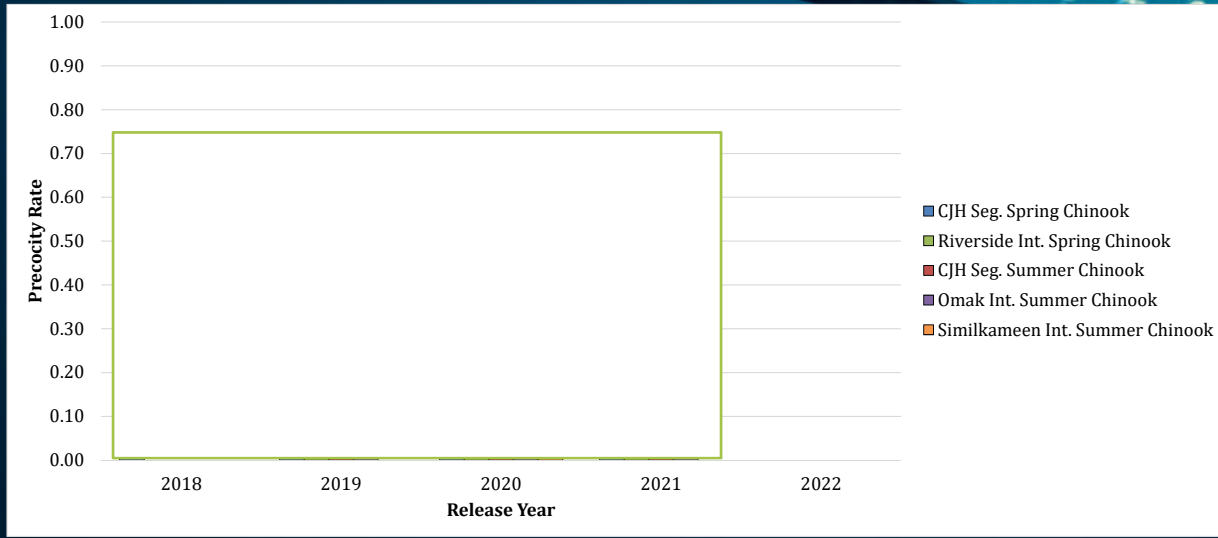
Summary of Results

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 (10j)	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	386,943 (Released 12/5/21)	Did not sample	N/A	N/A

Precocity Rates (Visual)



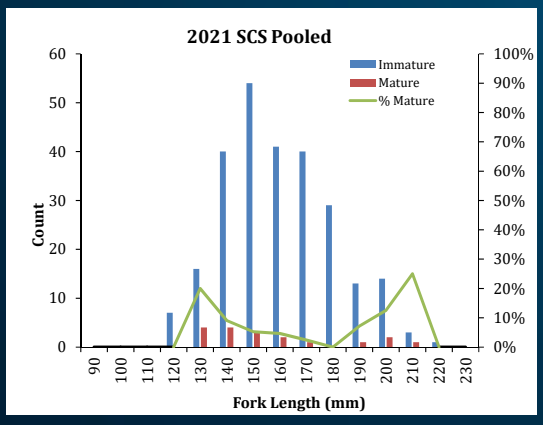
Precocity Rates (Modeled)

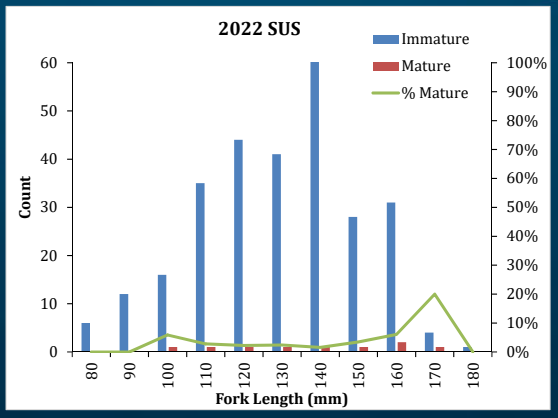


Summary of Results

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- Omak	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%
Total	**441**	**570**	**77.4%**
Segregated (HOR)			
	# Fish Spawned	# Brood Collected	% Survival to Spawn
Females	226	283	79.9%
Males / Jacks	172 / 2	260 / 14	63.5%
Total	**400**	**557**	**71.8%**

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%
Total	**270**	**1,082,792**	**686,898**	**4,010**	**63.4%**

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

BY22 Summer Chinook Segregated Egg Take

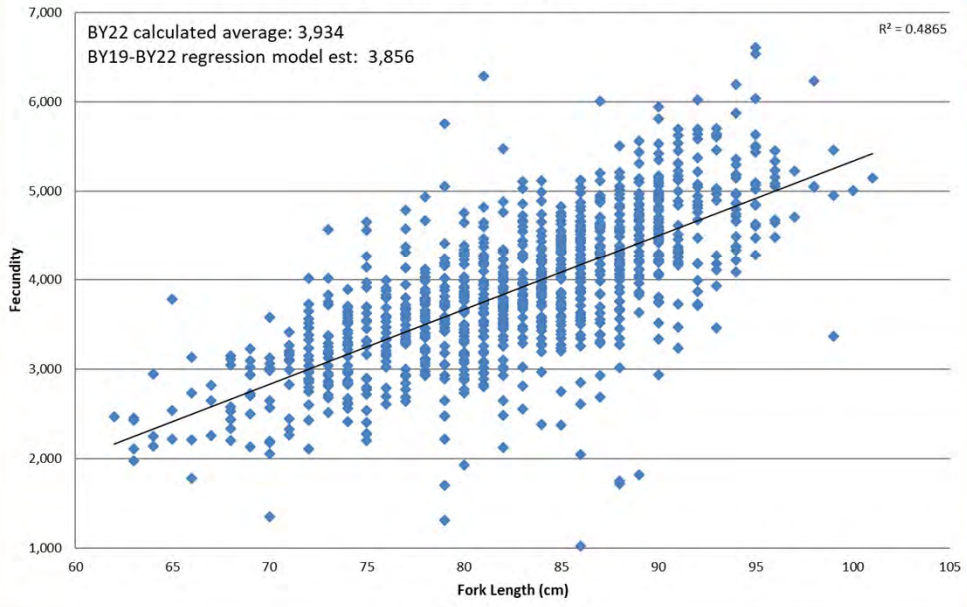
- **Segregated (HOR) Eyed-Egg Take Target: 1,060,200**
  - 619,199 total eyed eggs (58.4% of target)
- **Contributing factors to reduced eyed egg take:**
  - Pre-spawn survival below assumed 90% survival:
    - 71.8% actual, though female survival was 79.9%
  - Fecundity below assumed fecundity of 5,000
    - 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

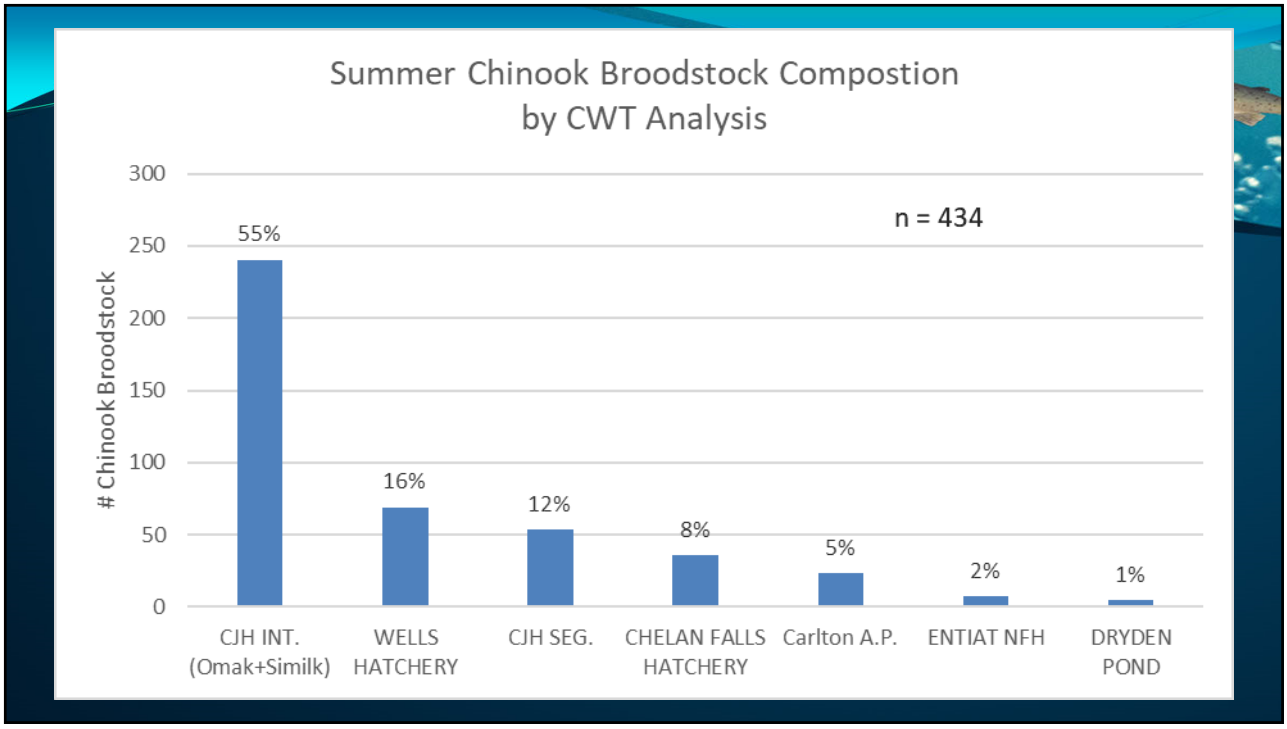
BY22 Summer Chinook Segregated Egg Take

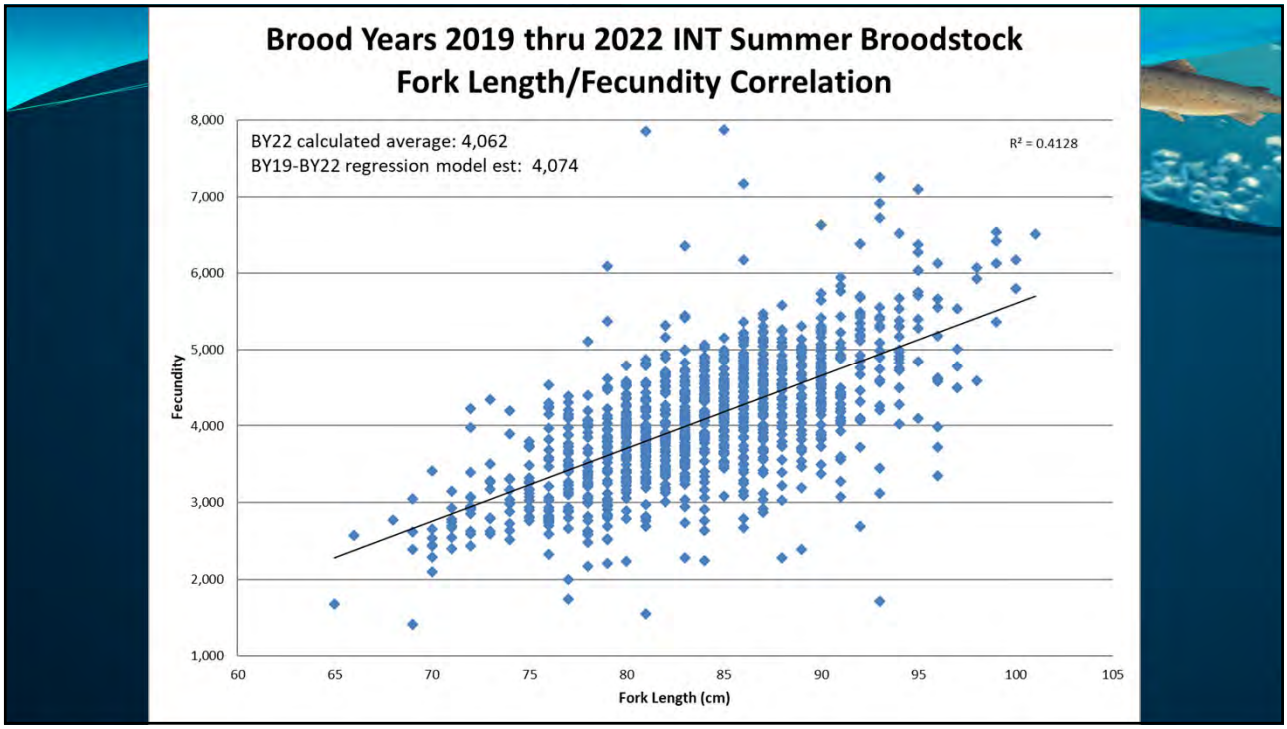
Segregated (HOR) Egg Take*					
Spawn Date	# Females Spawned	Green Eggs	Eyed Eggs	Fecundity	% Survival
Oct. 4, 2022	20	77,423	73,930	3,871	95.5%
Oct. 11, 2022	40	156,476	129,709	3,912	82.9%
Oct. 18, 2022	95	366,071	288,807	3,853	78.9%
Oct. 25, 2022	44	160,362	74,896	3,645	46.7%
Nov. 1, 2022	23	82,678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

*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 Compostion
by CWT Analysis
Chinook Broodstock
300
250
200
150
100
50
0
n = 434
55%
16%
12%
8%
5%
2%
1%
CJH INT. (Omak+Similk)
WELLS HATCHERY
CJH SEG.
CHELAN FALLS HATCHERY
Carlton A.P.
ENTIAT NFH
DRYDEN POND



Integrated (NOR) Summer Chinook In-Hatchery Performance

Parameter	Goal	Mean	# Years Targets Met	BY 2022 (69.5%)	BY 2021	BY 2020	BY 2019 (59% NOB)	BY 2018 (62% NOB)	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 (4,010)	4,162 (4,061)	4,012	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%^	77.1%	81.8%	38.2%	87.1%
Egg-to-Smolt Survival – Subyearlings	**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^	594,716	708,336	235,740	520,780
Releases – Sub-yearlings	**300,000**	**51,564 (17.2%)**	0/5	N/A	0	88,474	169,344	0	0

*Beginning with BY21, fecundity includes non-viable eggs, with the smaller number being fecundity excluding those eggs.
^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	3,830 (3,797)	4,053 (3,960)	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%^	84.8%	84.3%	52.8%	87.3%
Egg-to-Smolt Survival – Subyearlings	**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^	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

*Beginning with BY21, fecundity includes non-viable eggs, with the smaller number being fecundity excluding those eggs.
^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 (HOR)	Integrated (NOR)	# Years Targets Met Segregated	# Years Targets Met 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* (64.4%)**	1/4	0/4
Releases – Sub-yearlings		**179,559 (44.9%)**	**51,564 (17.2%)**	0/5	0/5

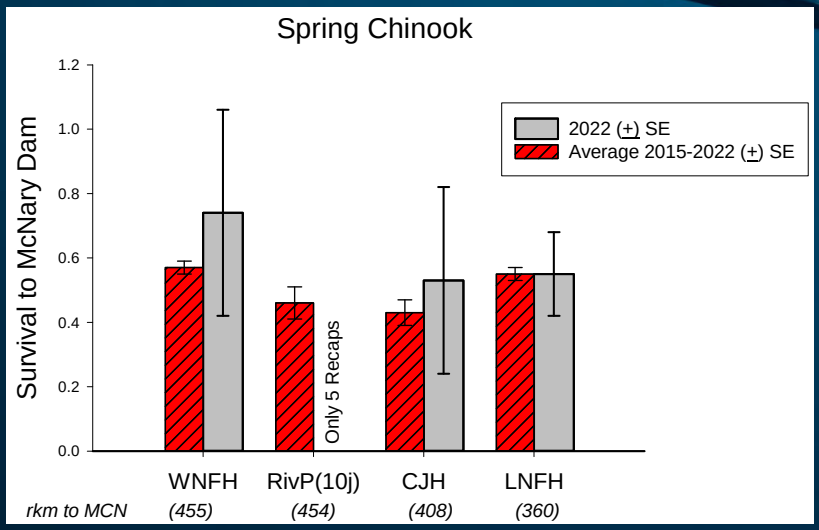
*Does not include BY21.
NOTE: No INT sub-yearlings in BYs 17, 18, 20 & 21 and no sub-yearlings for SEG program in BY18.

Spring Chinook
2022 Release Summary

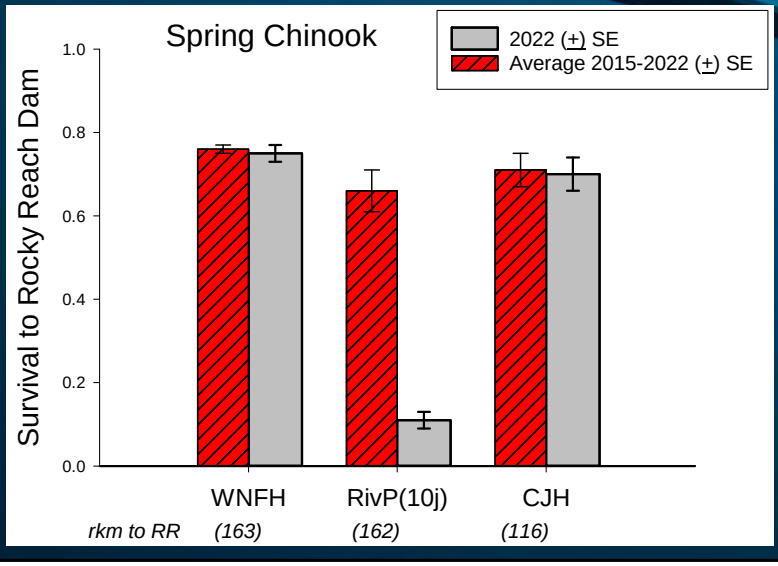
Spring Chinook							
Stock	**Brood Year**	**Release Date(s)**	**Site**	**Method**	**Size (fpp)**	**# Fish**	**Target**
Leavenworth	2020	4/19/22	CJH (Columbia R.)	Forced	10.0	814,613	700,000
MetComp 10j*	2020	12/7/21	Riverside AP (Okanogan R.)	Forced	19.0	229,978	200,000
				TOTAL:		**1,044,591**	**900,000**

*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 RRJ 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%
Total	**511**	**629**	**81.2%**

Bio-criteria standard for survival to spawn: 90%
*Brood collected includes 305 females and 286 males from LNFH.

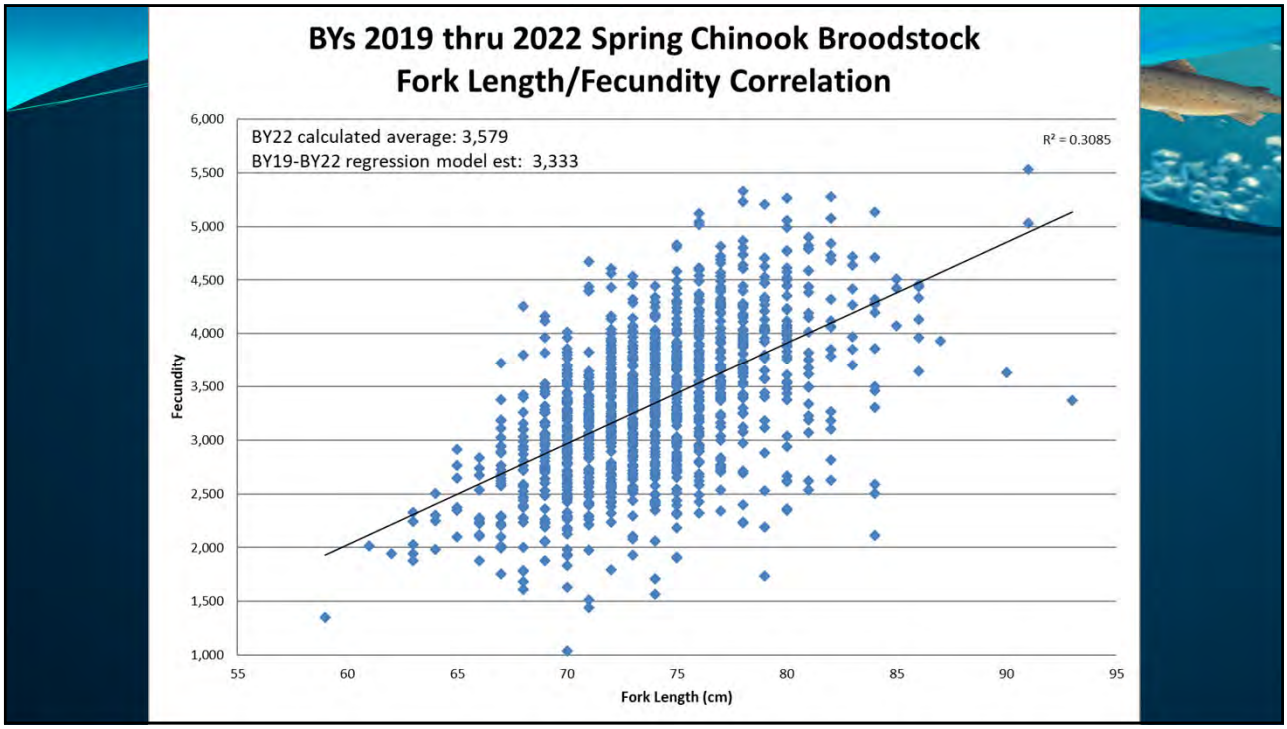
BY22 HOR Spring Chinook Egg Take

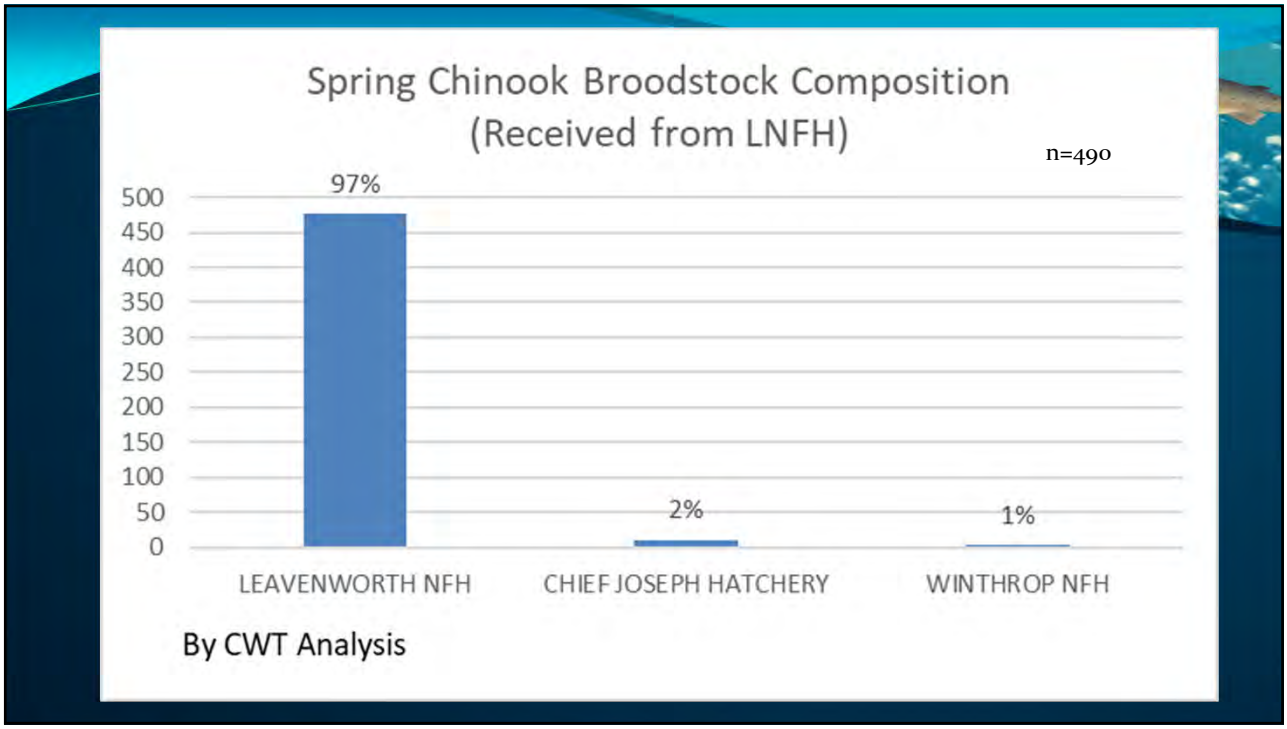
- **Eyed-Egg Take Target: 787,968**
  - 904,211 CJH eyed eggs (114.8% of target)
- **Contributing factors to increased eyed egg take:**
  - Pre-spawn mortality was very low in females (5.6%)
  - Increase in number of females spawned
  - Green to eyed egg survival exceeded goal (92.1%)
  - Culling rate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

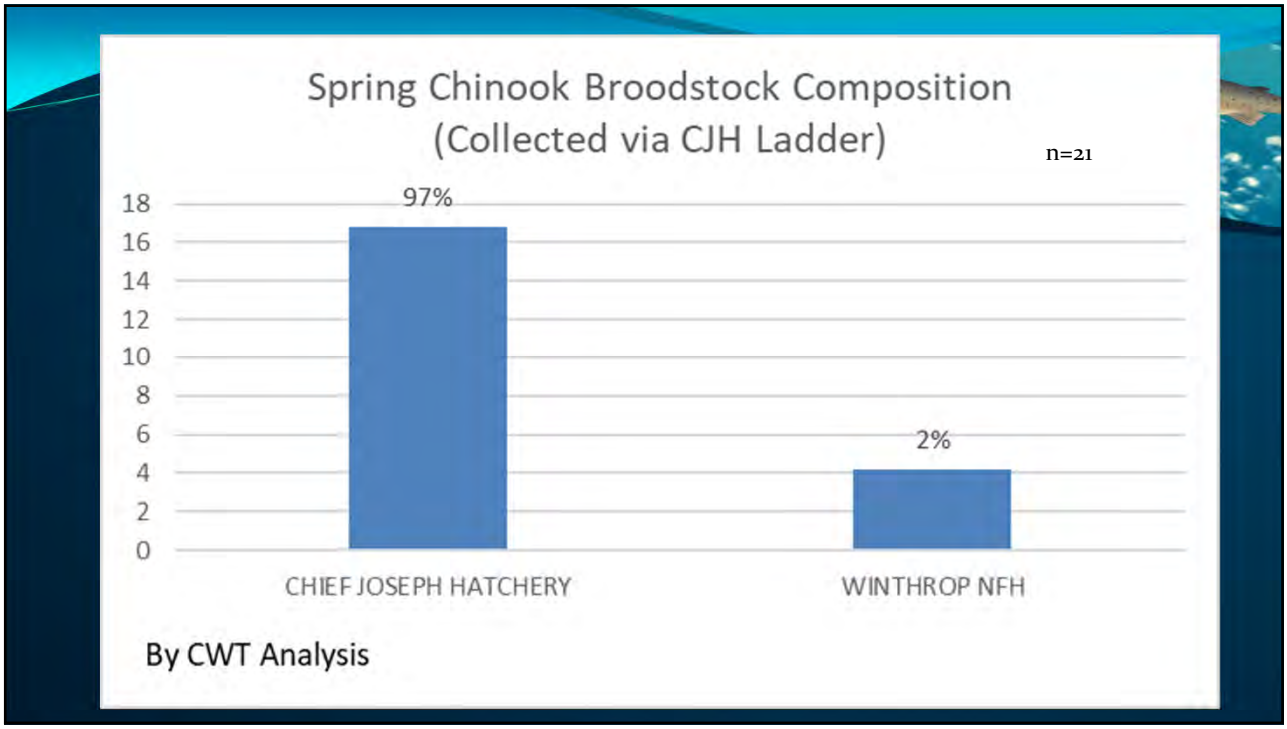
BY22 HOR Spring Chinook Egg Take

Spring Chinook Egg Take*					
Spawn Date	# Females Spawned	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%
Total	**281**	**981,362**	**904,211**	**3,492**	**92.1%**

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




Spring Chinook Broodstock Composition
(Received from LNFH)
n=490
97%
2%
1%
500
450
400
350
300
250
200
150
100
50
0
LEAVENWORTH NFH
CHIEF JOSEPH HATCHERY
WINTHROP NFH
By CWT Analysis


Spring Chinook Broodstock Composition
(Collected via CJH Ladder)
n=21
97%
2%
18
16
14
12
10
8
6
4
2
0
CHIEF JOSEPH HATCHERY
WINTHROP NFH
By CWT Analysis

HOR Spring Chinook In-Hatchery Performance

Parameter	Goal	Mean	# Years Targets Met	BY 2022 – CJH & LNFH stock	BY 2021 – CJH & LNFH stock	BY 2020 – CJH stock	BY 2019 – CJH stock	BY 2018 – CJH 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 (3,492)	3,471 (3,451)	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%^	88.5%	89.7%	11.2%	72.5%
Releases	**700,000**	**496,991 (71.0%)**	**2/4**	N/A	907,356^	814,717	793,984	102,702	276,560

*Beginning with BY21, fecundity includes non-viable eggs, with the smaller number being fecundity excluding those eggs.
^Estimated as of March 15, 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 morts 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
				SUBTOTAL:		**715,000**	**1.3 M**
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
				SUBTOTAL:		**130,000**	**700,000**
				GRAND TOTAL:		**845,000**	**2.0 M**

*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
				TOTAL:		**1,065,000**	**900,000**

*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 morts 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?

Questions?

2022 Okanogan

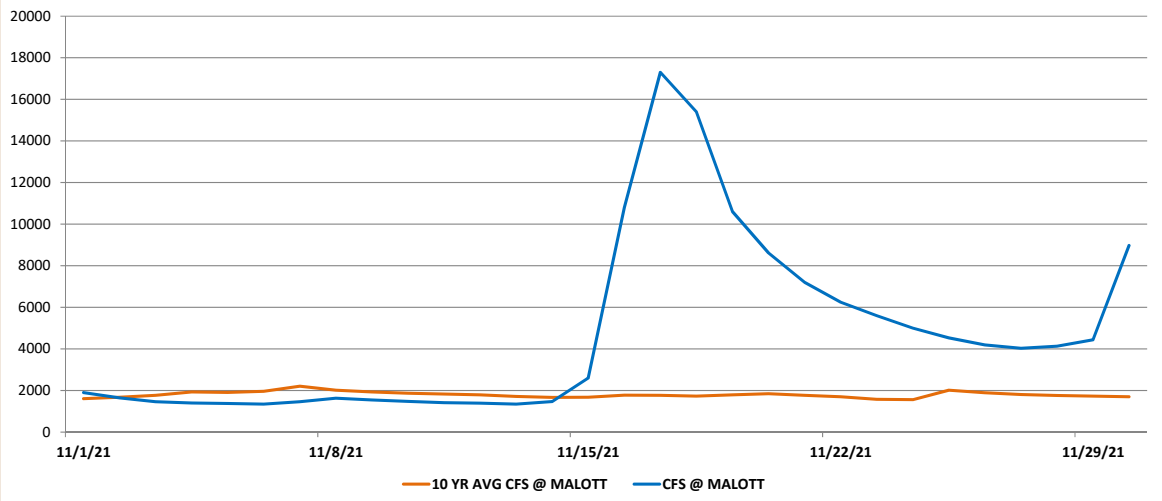
Juvenile Chinook Monitoring
Rotary Screw Trap & Beach Seine

Kirsten Brudevold
M&E Biologist
Chief Joseph Hatchery Science Program

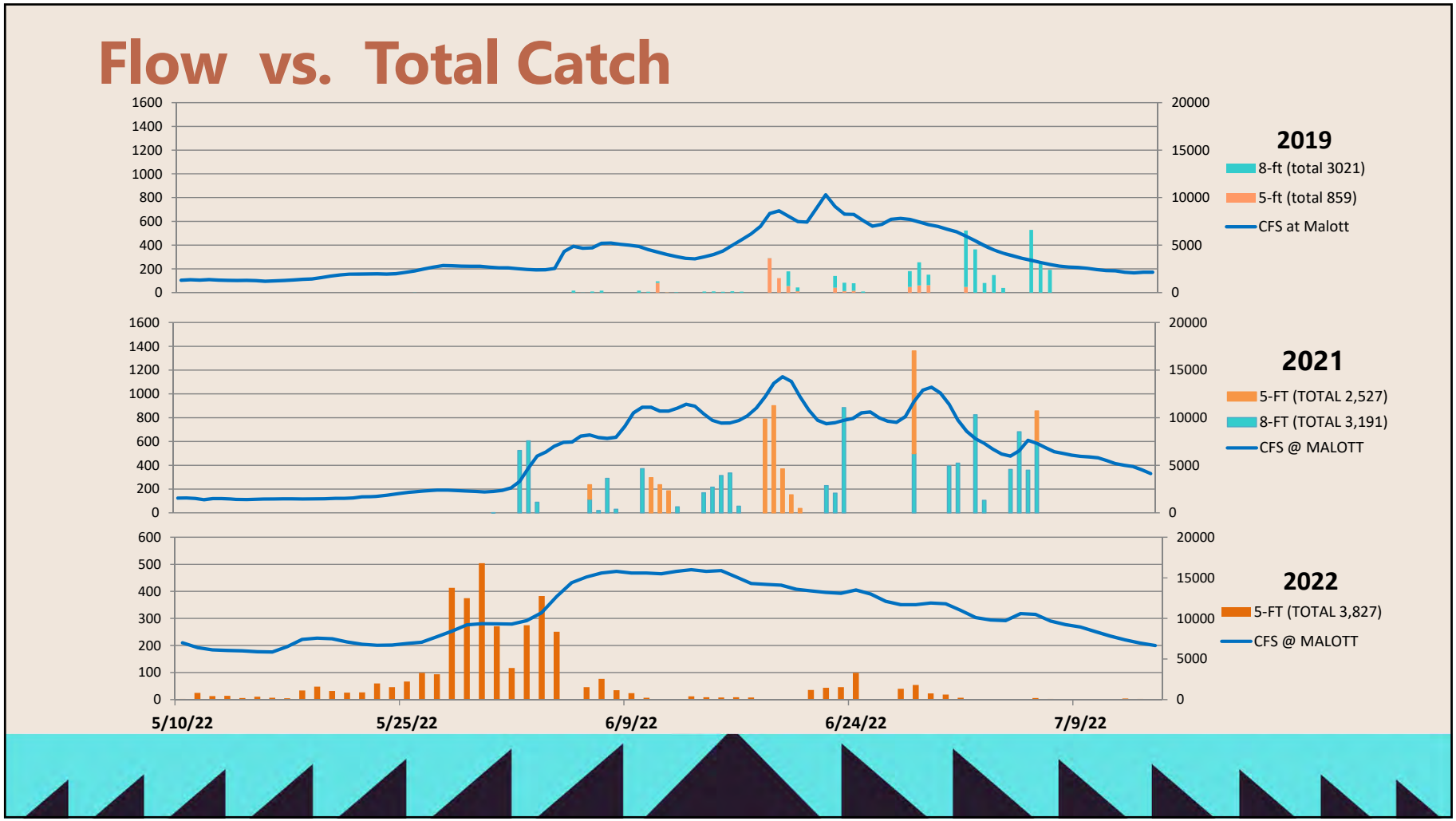
RST Configuration

The 5-ft cone fishes along the bank at flows over ~5,000 cfs

2021 OKANR November Extreme High Flow Event

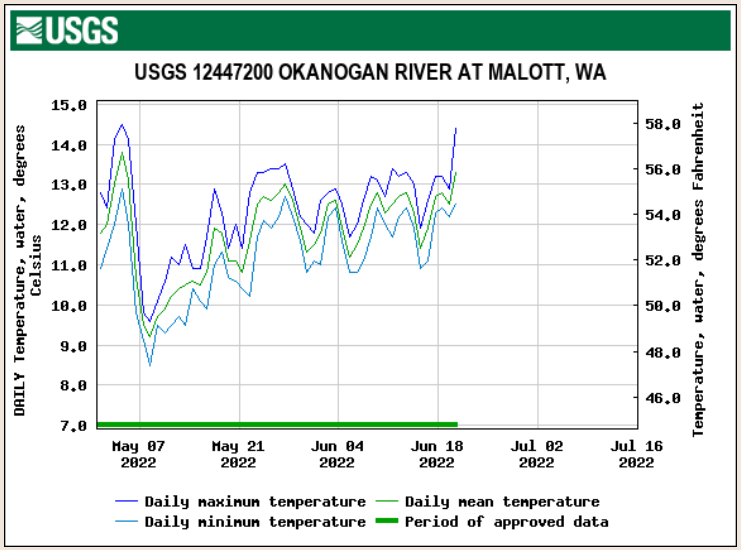


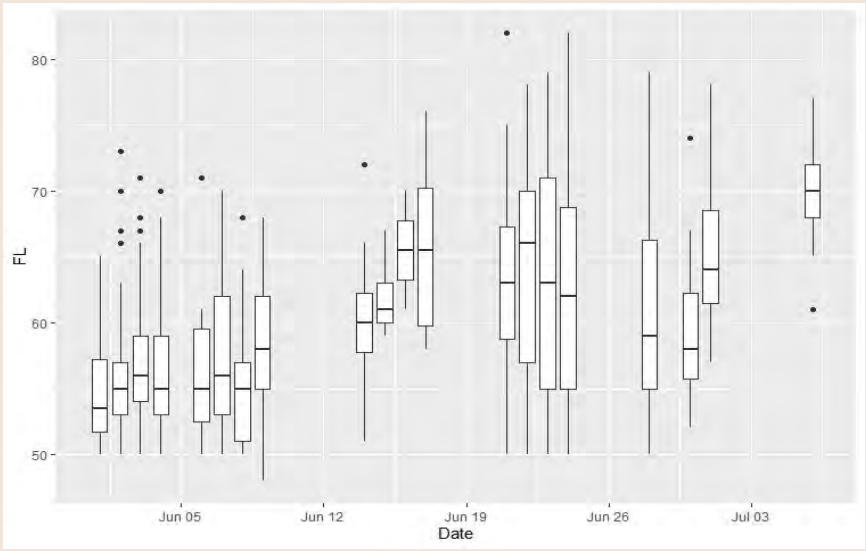
Flow vs. Total Catch



2022

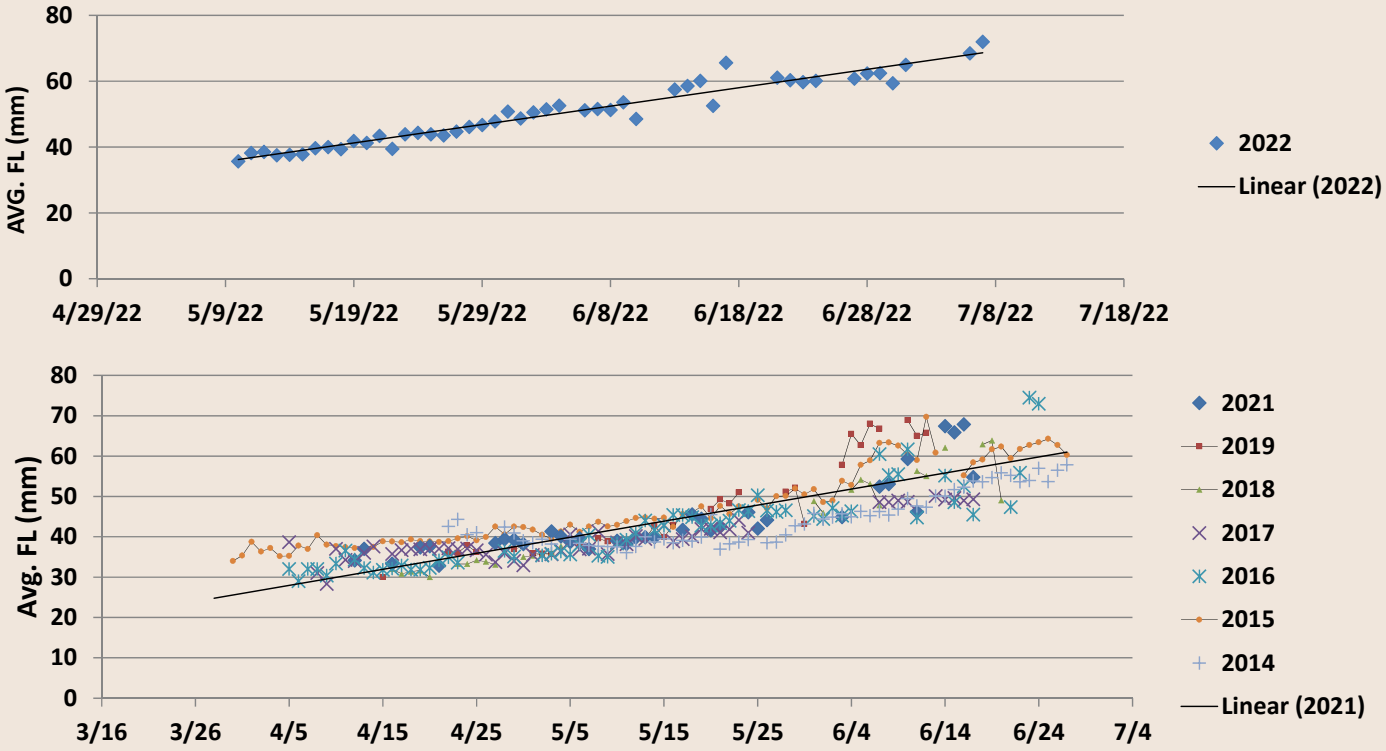
817 fish swam away from the RST with a PIT tag.





USGS Current Conditions for USGS 12447200 OKANOGAN RIVER AT MALOTT, WA

Growth Rate



Year	Growth Rate (mm FL/day)
2014	.26
2015	.35
2016	.37
2017	.23
2018	.43
2019	.66
2020	N/A
2021	.40
2022	.56

RST Moving Forward….

Logistics
- Configuration (two 5’ traps along the margin)
- Operation Schedule (24/7 @ >5,000cfs)

Data Collection
- Efficiency trials during various flow conditions
- Deploying juvenile Chinook PIT tags
- Juvenile PIT tagging in side channel (comparing fish size & growth rates)

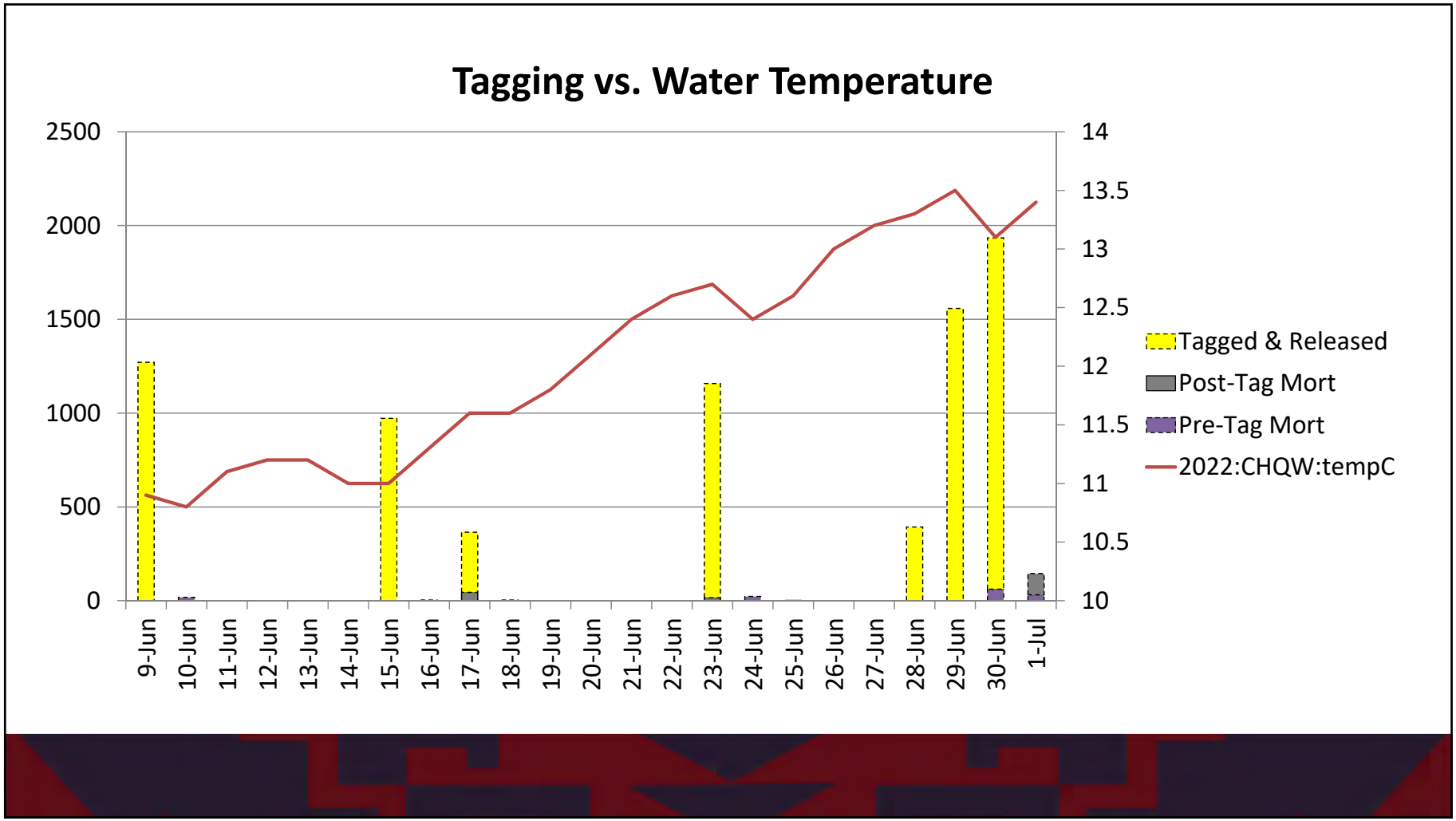
Post Season Analysis
- Does the new rotary screw trap configuration allow us to estimate juvenile outmigration?


Juvenile Beach Seining

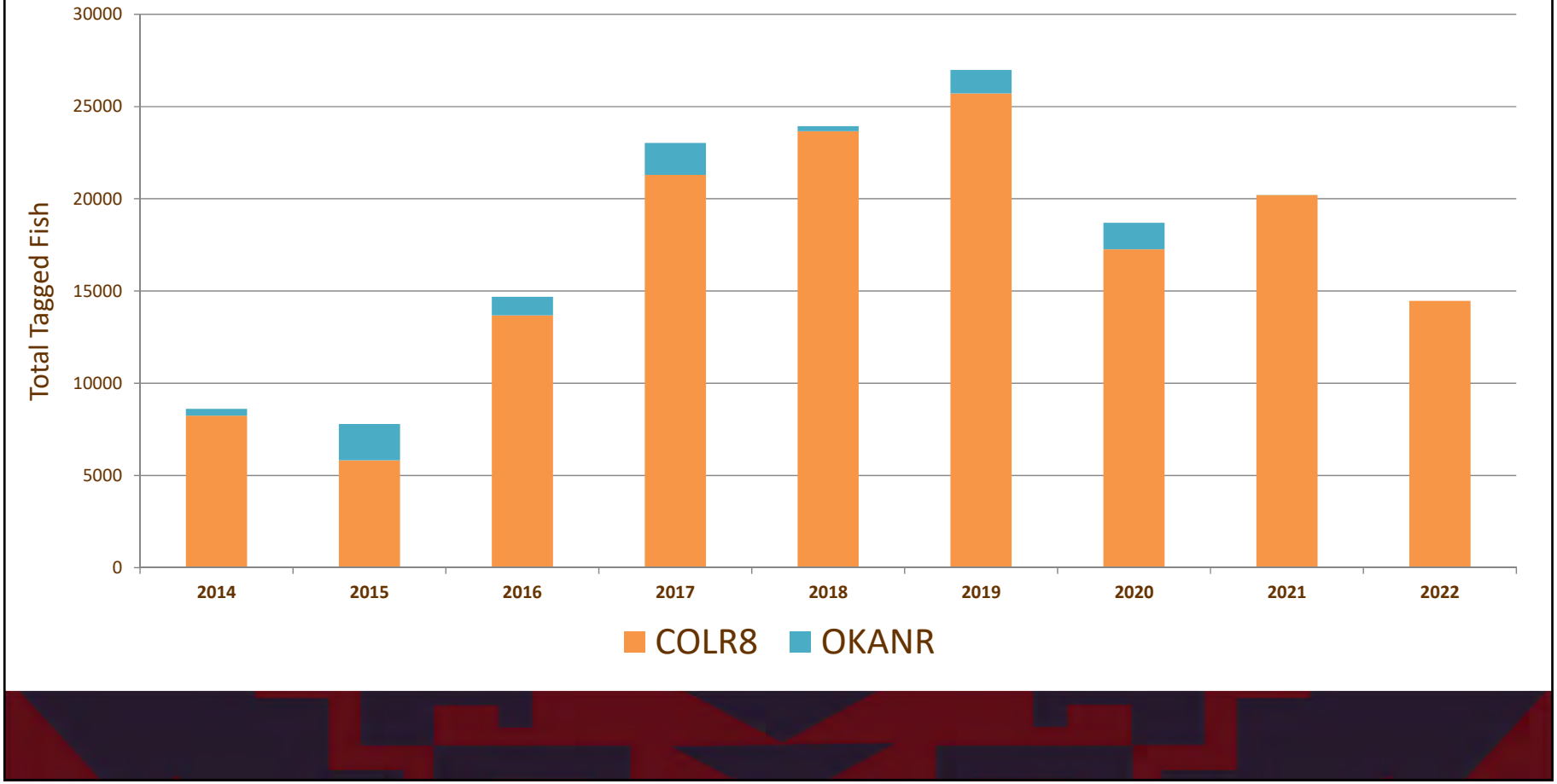

Gebbers Landing
Anderson Field Airport-S97
Tagging Site
Okanogan River
Columbia River
Lake Pateros
Columbia River

Juvenile Beach Seine PIT Tag Effort @ Gebbers Landing

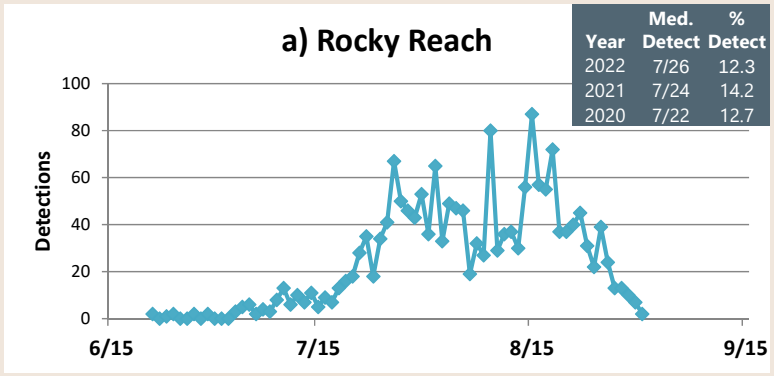
	2020	2021	2022
TOTAL DAYS FISHED	26	10	20
# SETS	220	79	207
AVERAGE SETS/DAY	7.86	7.90	10.3
TOTAL CATCH	20,340	29,043	21,110
CATCH PER UNIT EFFORT	92.45	367.63	101.9
HOR RECAPTURES	1,878	379	784


Tagging vs. Water Temperature
2500
2000
1500
1000
500
0
14
13.5
13
12.5
12
11.5
11
10.5
10
9-Jun
10-Jun
11-Jun
12-Jun
13-Jun
14-Jun
15-Jun
16-Jun
17-Jun
18-Jun
19-Jun
20-Jun
21-Jun
22-Jun
23-Jun
24-Jun
25-Jun
26-Jun
27-Jun
28-Jun
29-Jun
30-Jun
1-Jul
Tagged & Released
Post-Tag Mort
Pre-Tag Mort
2022:CHQW:tempC

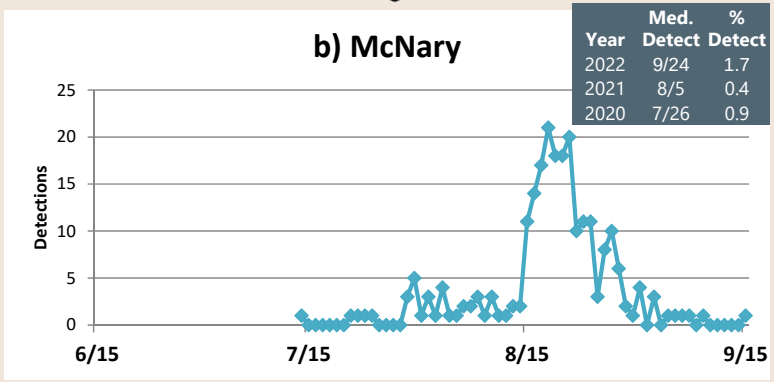
14,469 TOTAL PIT TAGS DEPLOYED IN 2022



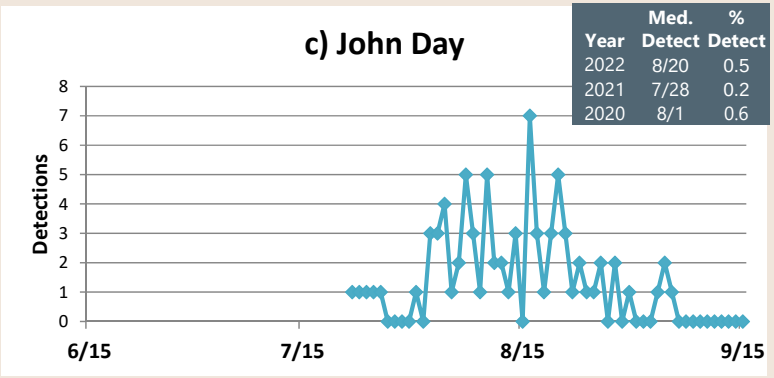
Distribution of Detections



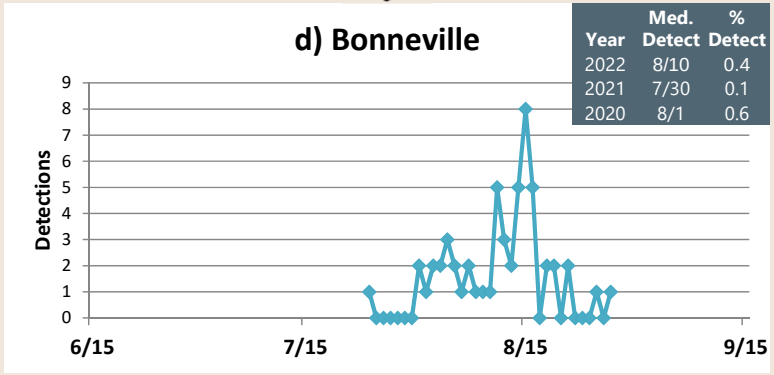
Year	Med. Detect	% Detect
2022	7/26	12.3
2021	7/24	14.2
2020	7/22	12.7



Year	Med. Detect	% Detect
2022	9/24	1.7
2021	8/5	0.4
2020	7/26	0.9



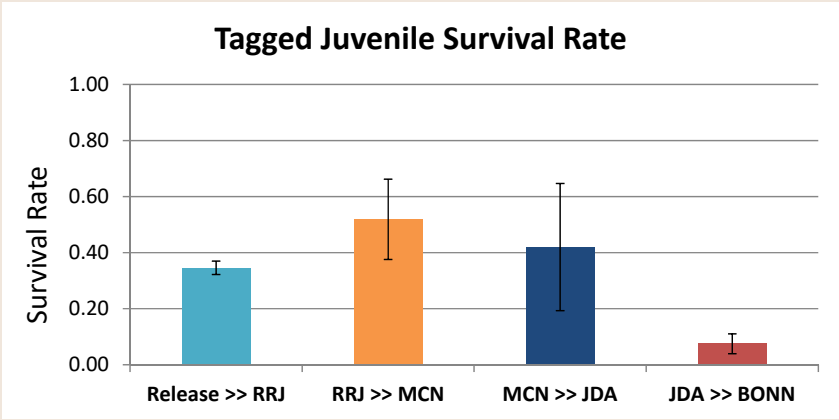
Year	Med. Detect	% Detect
2022	8/20	0.5
2021	7/28	0.2
2020	8/1	0.6



Year	Med. Detect	% Detect
2022	8/10	0.4
2021	7/30	0.1
2020	8/1	0.6

Juvenile Outmigration Survival Estimates

Release Year	RRJ	MCN	JDA	BONN
2020 (18,700)	2,839	173	128	113
2021 (20,200)	2,869	72	35	16
2022 (14,469)	1,737	243	77	55



Cormack/Jolly-Seber Estimates (Cormack 1964, Jolly 1965, Seber 1965)

HIGH FIVES TO OUR TECHNICIANS!

>>>Amber Cate<<<

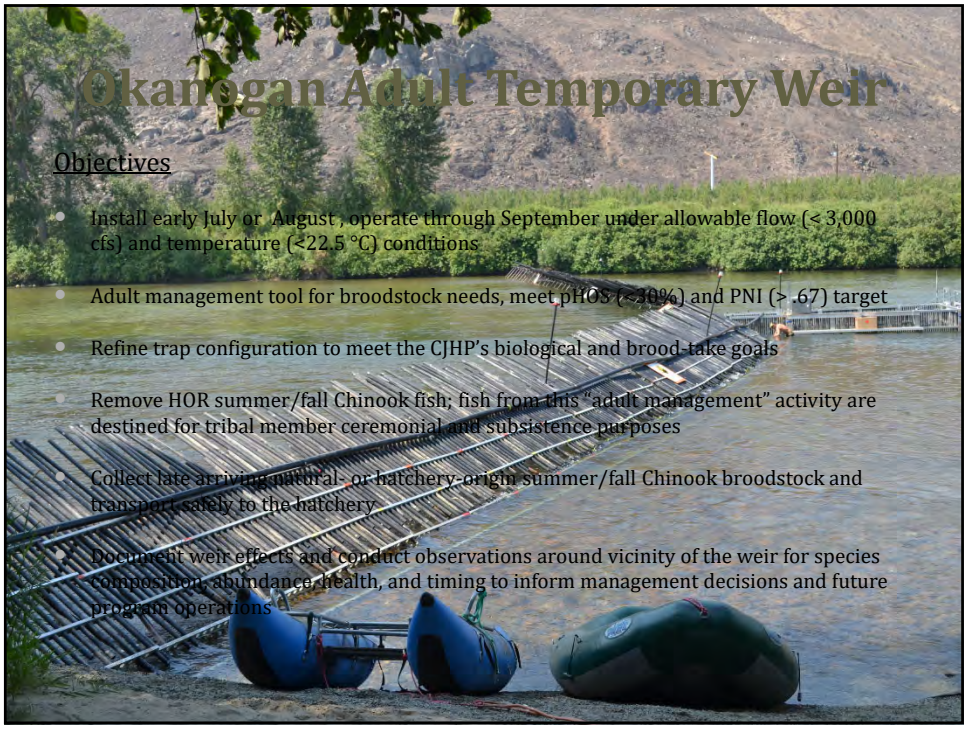
>>Jesse Marchand<<

>>John Pakootas<<

>>>Tatum Gunn<<<

>>Vertis Campbell<<


Any Questions?

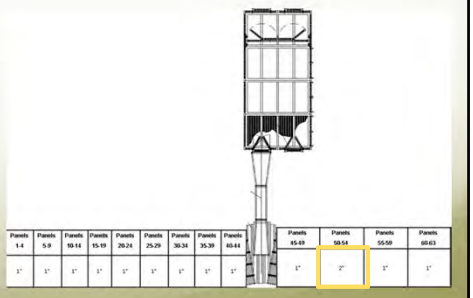


2022 Operation

- Deployed on August 30th at 1,080 cfs flow @ Malott
- Completed September 8th with underwater video system
- Daily monitoring activities began following week
- Trapping began on September 8th
  - Trapped for 15 days
  - Ended on September 22nd
- Configuration
  - River right- 1" picket spacings
  - River left- 1" picket spacings, set of (5) 2" picket spacings for passage, similar to previous years

2022 Configuration and Design

- Installed the accelerator chute again
- Installed a light bar and camera housing on west side trap and two on the chute
- Installed the Whooshh™ fish transport system for brood stock collection from 9/12-9/21
- Used an aerial cable system for the weir video cables again



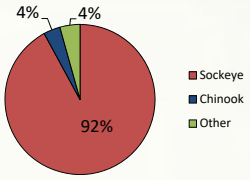
Daily Monitoring Activities

- **Daily maintenance-** debris, algae removal, carcass removal, cameras, lights
- **Water quality:** temperature, dissolved oxygen, and turbidity
- **Water velocity and head differential***
- **Direct observations** (estimates)
  - Tower- 2x/day, 5 minutes, morning and afternoon
  - Bank- about .8 river km downstream, 2x/day, 10 minutes
- **Mortalities**
  - Collected, assessed, biological information
    - 5 Chinook carcasses (2 HOR, 3 NOR)
    - 128 Sockeye
- **Underwater video review**
  - 2 cameras along the chute (1 DS, 1 US) and 1 camera inside trap (west panel)
  - Live monitoring to assist in daytime trapping

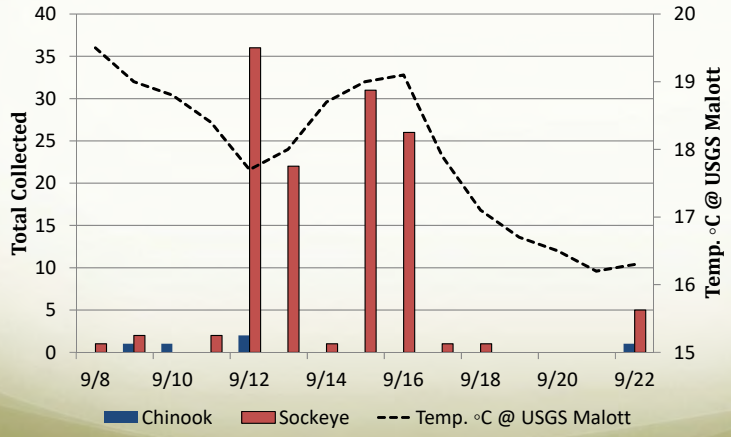
Water Quality

https://waterdata.usgs.gov/monitoring-location/12447200/#parameterCode=00060&startDT=2022-07-01&endDT=2022-10-31

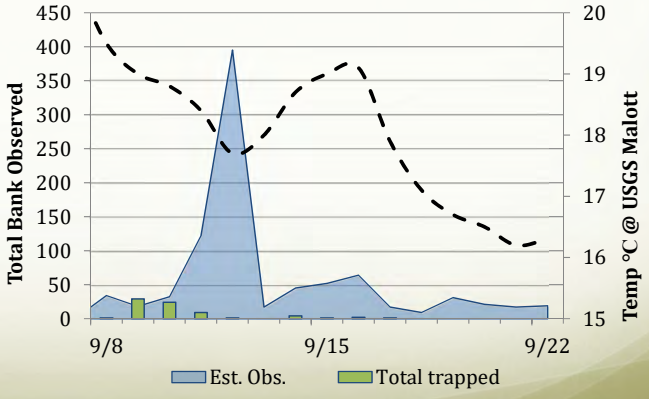
Carcasses at the Weir



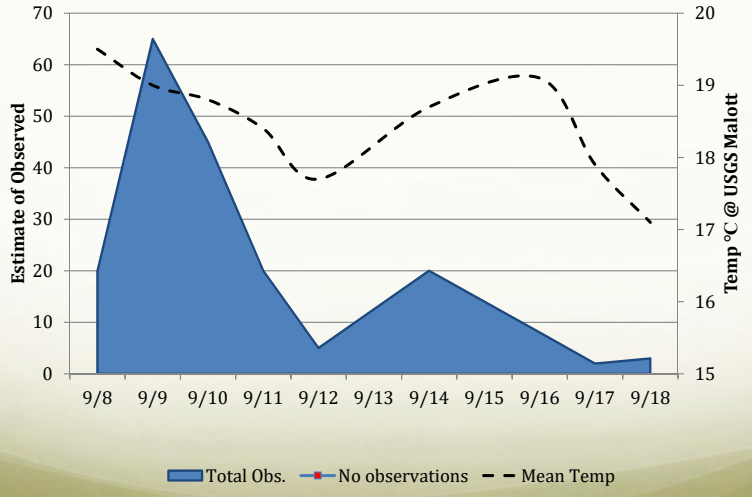
n=139



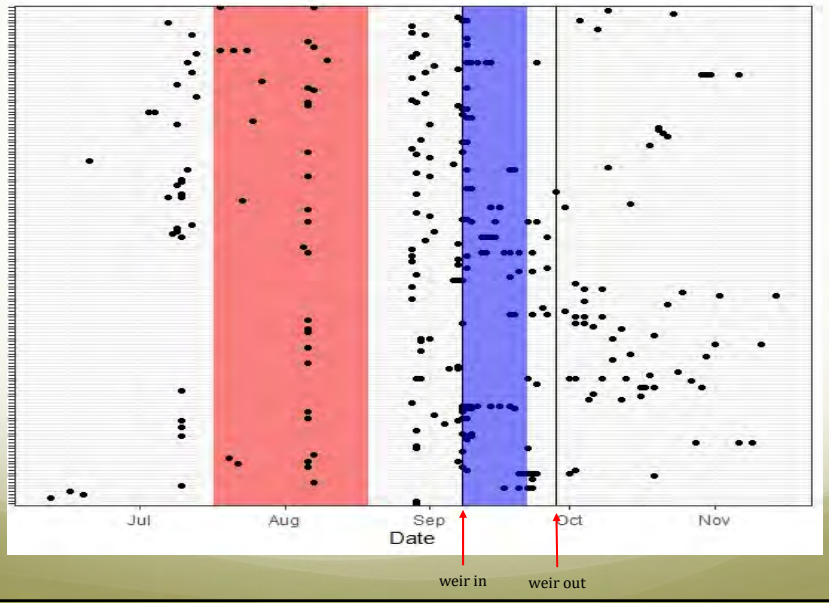
Bank Observations



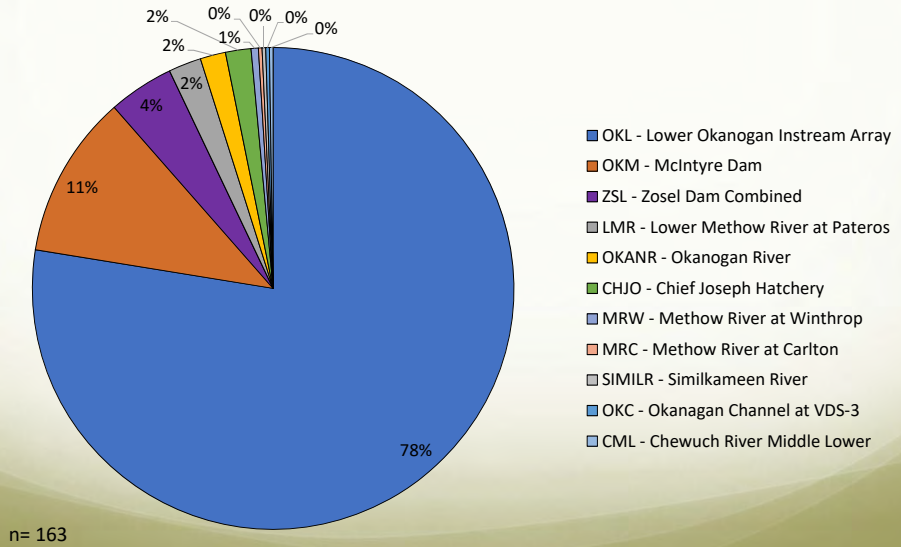
Tower Observations



OKL Array 2022

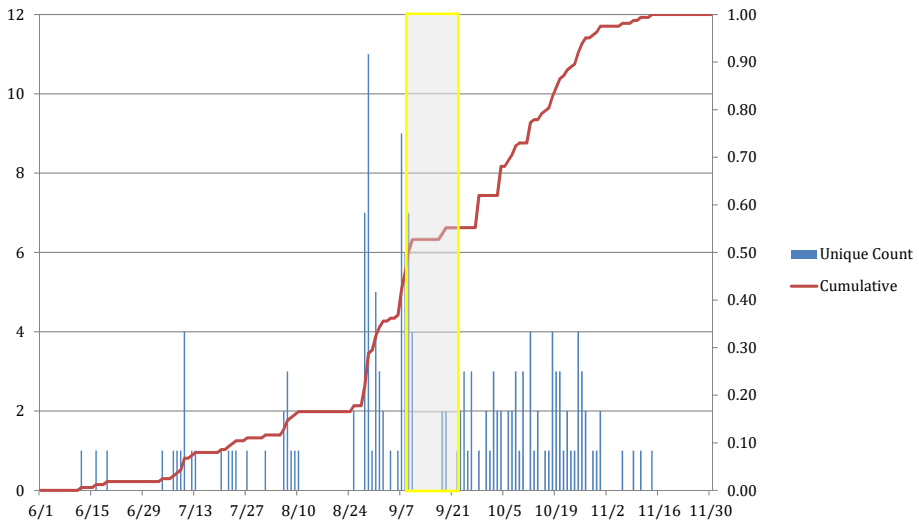


Last Detection Site



n= 163

Last Detection OKL

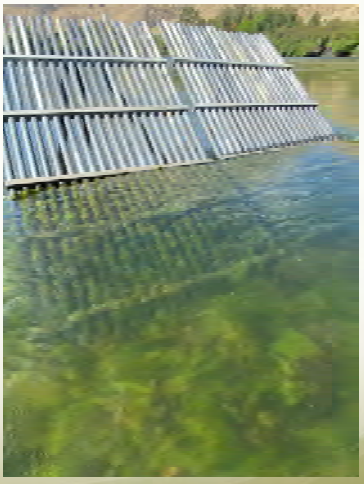


Trapping Operations

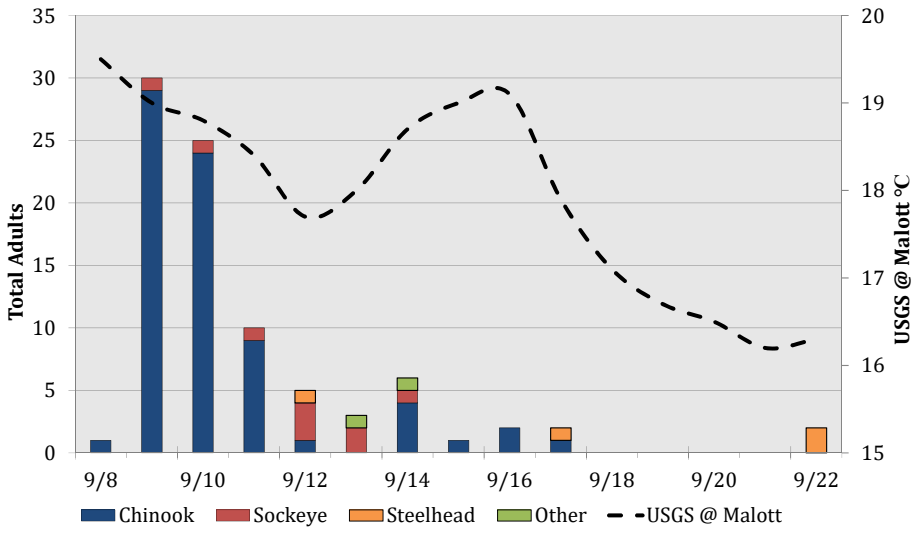
- Trapping began on September 8th, ended on Sept. 22nd
- 72 adult summer Chinook
  - 42 NOR brood
  - 14 HOR brood
  - 14 HOR removed
  - 2 NOR released
  - 2 jacks
- 9 adult sockeye (all in first week)
- 4 steelhead (all HOR)

Environmental Conditions

- Similar to 2020 and 2021, algae was a major obstacle we had to overcome in August and early September
  - We could have installed in early August with discharge below 2600 cfs
  - Temps still above 22.5 till August 28th
- If conditions continue annually then will continue to limit our ability to trap and collect fish

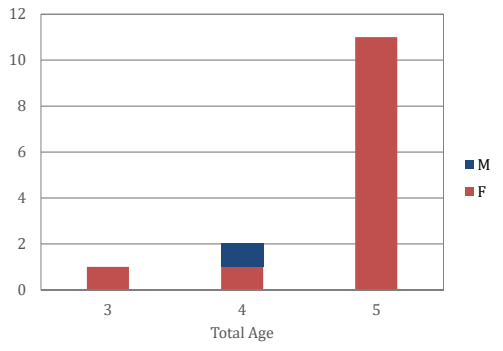


Daily Trapped



CWT Results- Weir Surplus

- 14 HOR surplussed
- 14 CWTs extracted and read
- 12 Recoveries from integrated summer releases (86%)
  - Omak Pond
- 2 recoveries from Lyons Ferry Hatchery (late-fall)



Survey Year	Chinook Adults Encountered in the Weir Trap		Chinook Spawning Escapement Estimates[c,d]		Weir Metrics	
	Natural Origin (NOR)	Hatchery Origin (HOR)	Natural Origin (NOS)	Hatchery Origin (HOS)	Weir Efficiency[a]	Weir Effectiveness[b]
2013	73	18	5,627	2,567	0.010	0.006
2014	2,006	318	10,407	1,756	0.147	0.140
2015	35	19	10,439	3,308	0.004	0.005
2016	135	34	8,700	1,905	0.014	0.016
2017	344	103	5,429	1,139	0.058	0.075
2018	32	16	3,266	1,594	0.009	0.009
2019	82	24	2,604	2,849	0.017	0.008
2020	709	161	7,957	3,061	0.066	0.045
2021	37	9	4,525	2,521	0.006	0.003
2022	43	27	2,002	2,390	0.014	0.010

[a] Estimates for weir efficiency are adjusted for prespawn mortality and include Chinook adults that are harvested, released, and collected for brood.

[b] Estimates for weir effectiveness are adjusted for prespawn mortality and include Chinook adults that are harvested or removed for pHOS management.

[c] Estimates do not include Chinook Zosel Dam counts.

[d] NOS and HOS estimates determined by 'reach-weighted' pHOS calculations

2022 Conclusions

- Flow was an issue for deployment in August- Installed in early- September at 1,080 cfs
- Did not meet NOR brood goal for 15% component of total, collected 9%
- 86% of hatchery recoveries in the trap were from the integrated program
- Use similar trap location in 2023 with Whooshh system
- Algae was an obstacle for the third year in a row that limited trapping operations for 10 days in late August and early September


THANK YOU TO OUR CCT FIELD STAFF
Vertis Campbell
Jesse Marchand
John Pakootas Jr.
Tatum Gunn
Kirsten Brudevold
Brian Dietz
Joseph Abrahamson
OBMEP Staff
Grant County
PUBLIC UTILITY DISTRICT
P.U.D.
CHELAN COUNTY
DOUGLAS COUNTY PUD

Chief Joseph Hatchery
2023 Annual Program Review

2022 Summer Chinook Spawning Grounds Summary

Andrea Pearl
Fisheries Biologist; Colville Confederated Tribes

Brian Dietz
Fisheries Biologist; Colville Confederated Tribes

Objectives

Monitor Status and Trends:

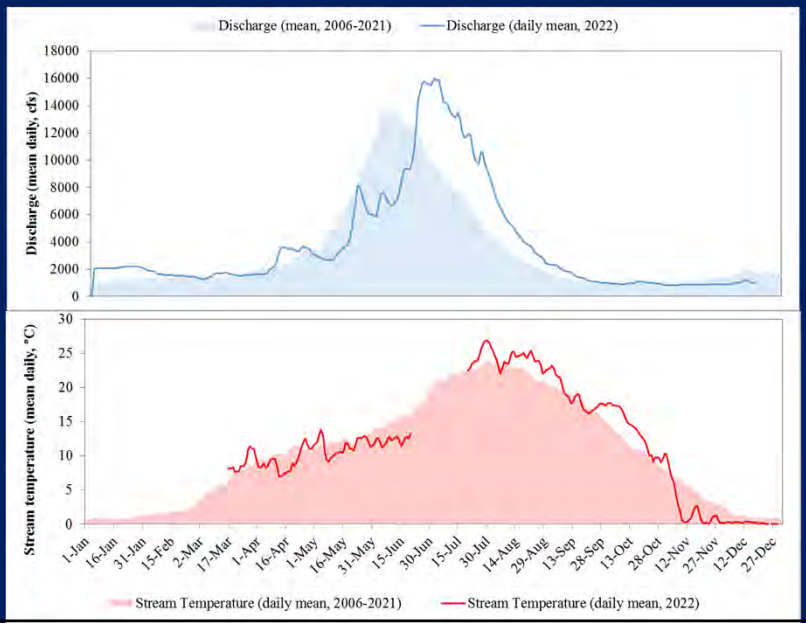
- Environmental Conditions
- Spawn timing
- Spatial distribution
- Pre-spawn mortality
- Age structure (scales, CWT)
- Stray rates
- Sex ratio
- Fish size

Estimate:

- Escapement
- Composition (pHOS)

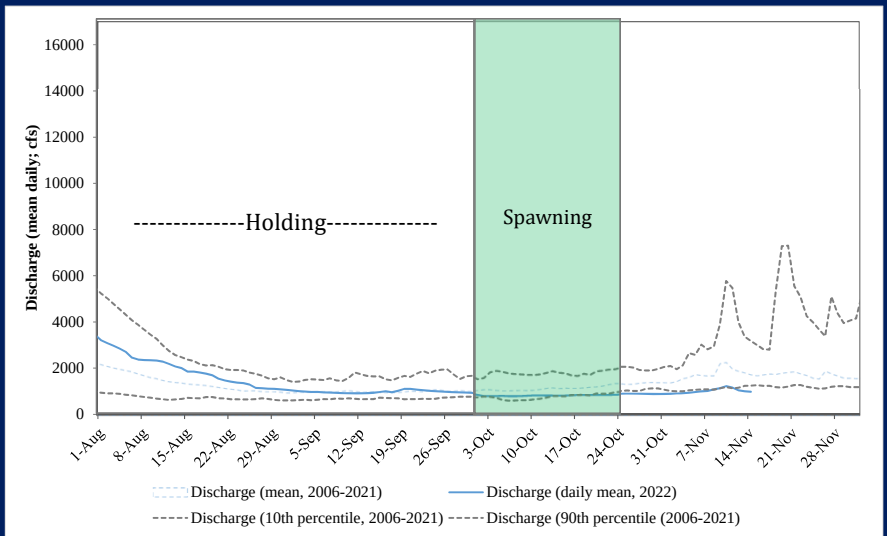
Environmental Conditions

2022 compared to previous 16 years



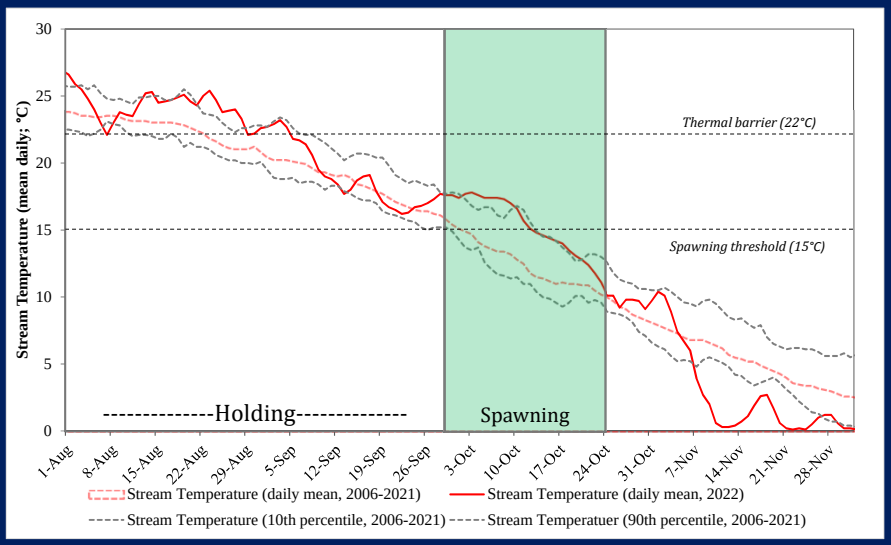
Environmental Conditions

2022 compared to previous 16 years



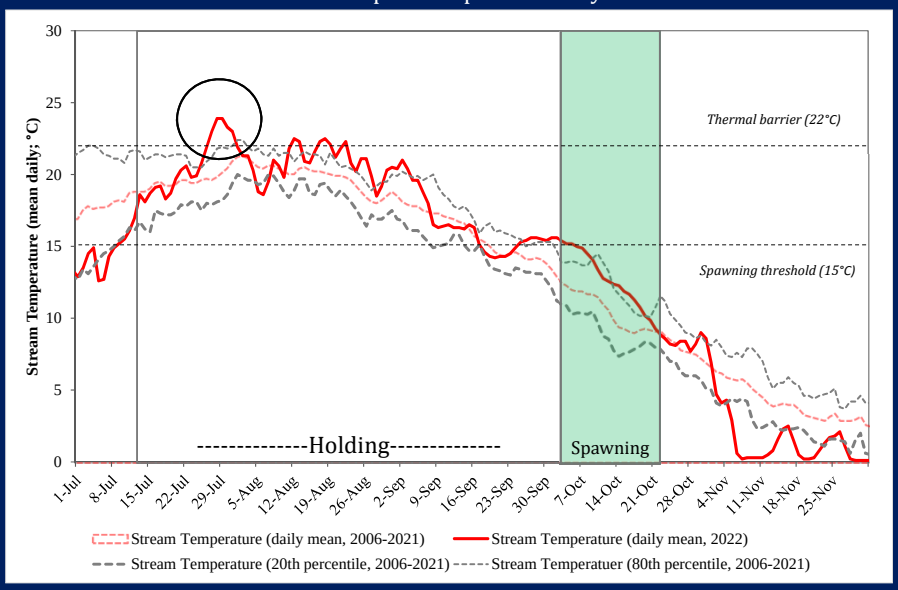
Environmental Conditions

2022 compared to previous 16 years



Environmental Conditions (Similkameen)

2022 compared to previous 16 years



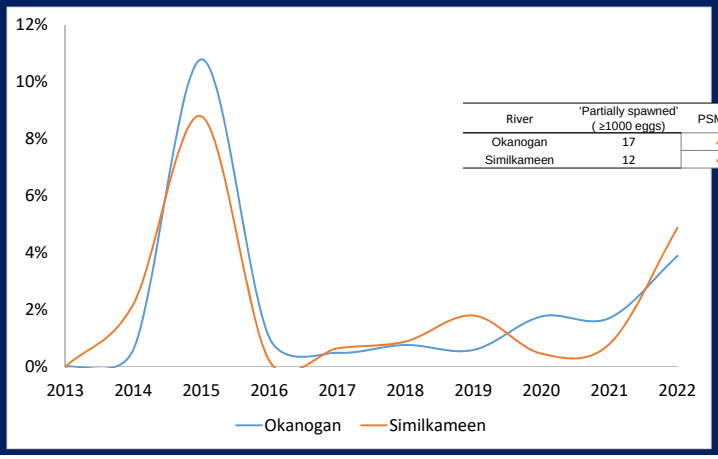
Environmental Conditions (Similkameen)

2022 compared to previous 16 years

	Temp in C°			
Year	July Max	Aug Max	Jul Avg	Aug Avg
2014	19.5	20.6	19.62	19.62
2015	23.4	22.2	20.92	19.71
2016	22.6	22.8	17.98	19.68
2017	22.6	22.6	20.63	20.51
2018	22.5	22.6	19.47	18.57
2019	21.8	22.9	16.86	20.28
2020	21.6	22.3	16.86	19.52
2021	23.8	23.0	21.52	19.55
2022	25.1	23.7	18.39	20.87

	Rank of each metric					
Year	July Max	Aug Max	Jul Avg	Aug Avg	Sum of ranks	Overall Rank
2014	9	9	4	6	28	
2015	3	8	2	4	17	4
2016	4	4	7	5	20	
2017	4	5	3	2	14	3
2018	6	5	5	9	25	
2019	7	3	8	3	21	
2020	8	7	8	8	31	
2021	2	2	1	7	12	2
2022	1	1	6	1	9	1

Pre-spawn mortality (PSM)

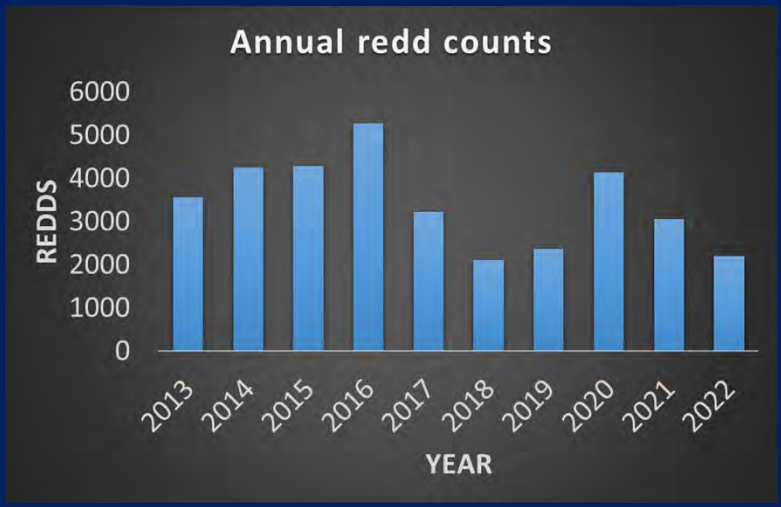


River	'Partially spawned' (≥1000 eggs)	PSM (≥1000)
Okanogan	17	4.42%
Similkameen	12	4.88%

Count of Recovered Female Carcasses (i.e., sample size)

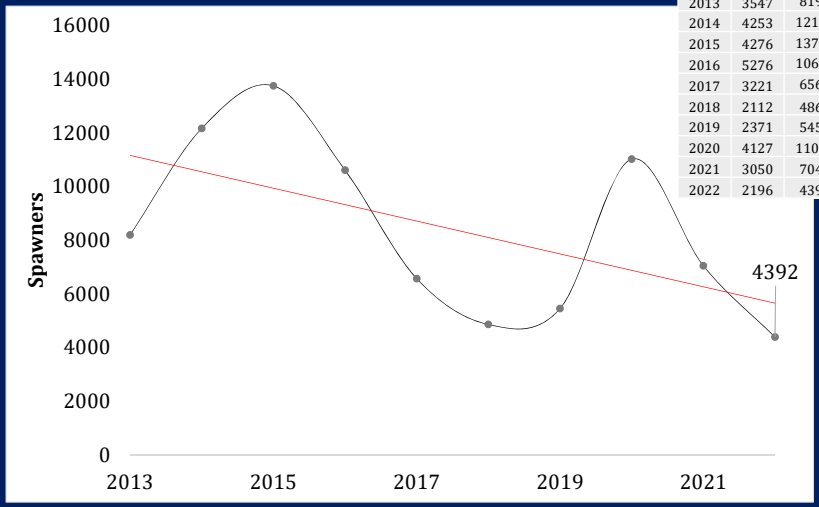
Basin	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Okanogan	314	621	398	786	412	261	170	734	469	385
Similkameen	249	681	923	1018	309	113	111	655	251	246
Total	563	1302	1321	1804	721	374	281	1389	720	631

Annual Redd Counts

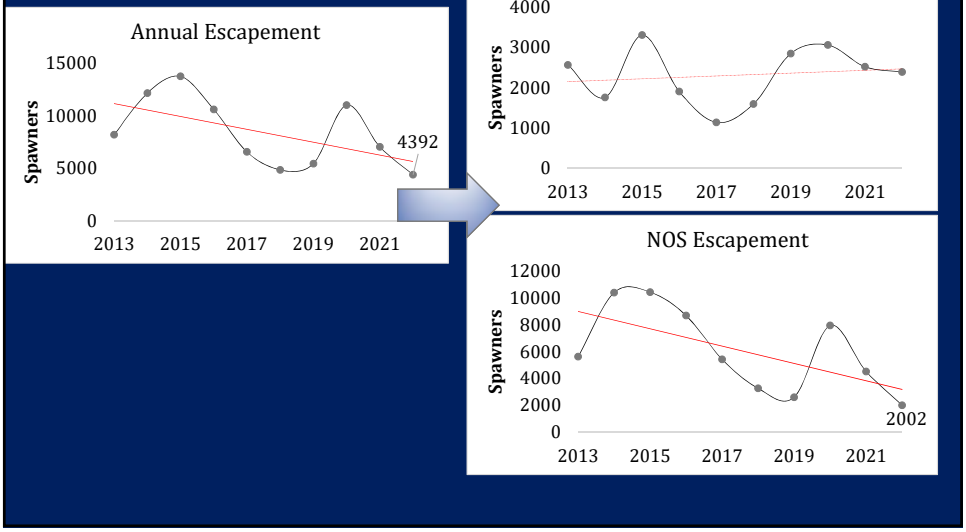


Annual Escapement

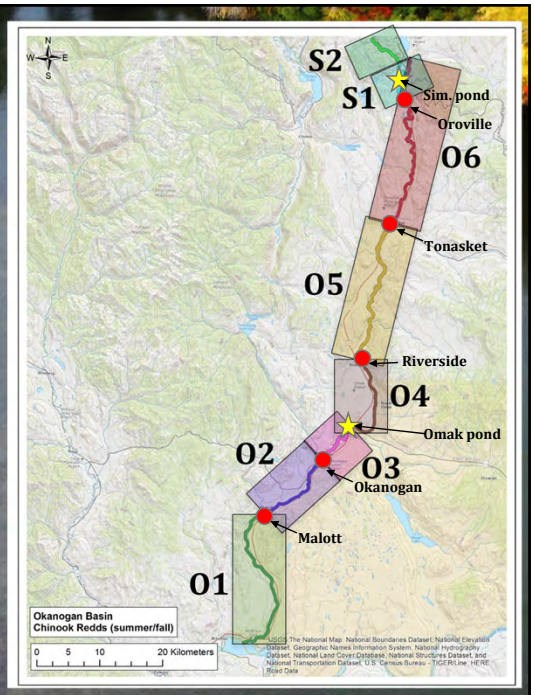
Year	Redds	Spawners	Fish per Redd
2013	3547	8194	2.31
2014	4253	12164	2.86
2015	4276	13748	3.215
2016	5276	10605	2.01
2017	3221	6568	2.039
2018	2112	4860	2.301
2019	2371	5453	2.3
2020	4127	11019	2.67
2021	3050	7046	2.31
2022	2196	4392	2.00

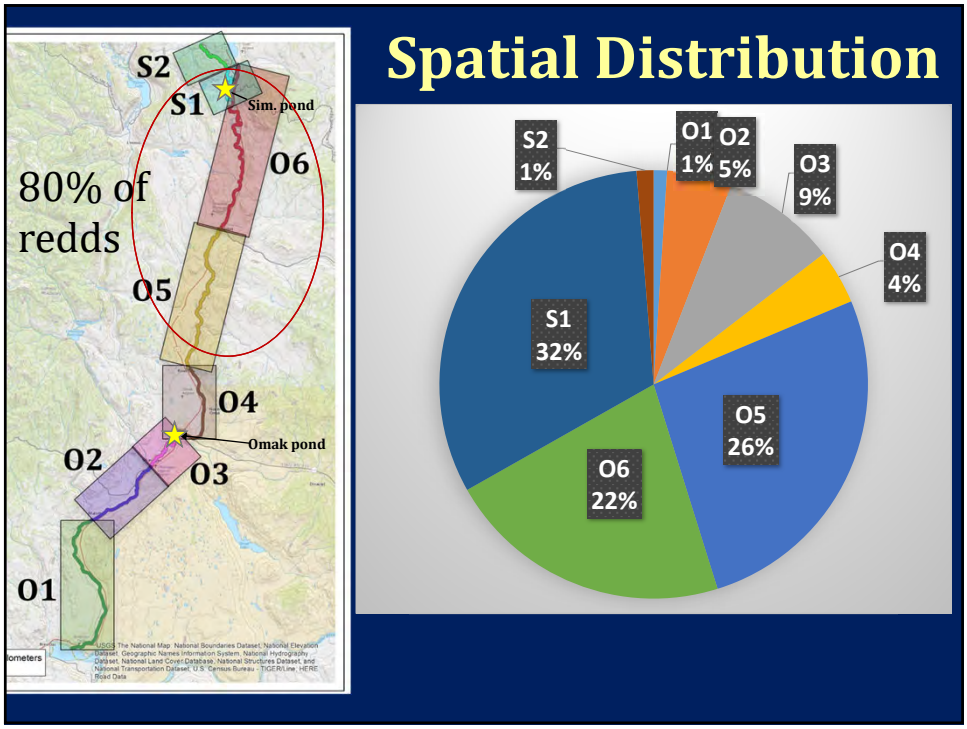


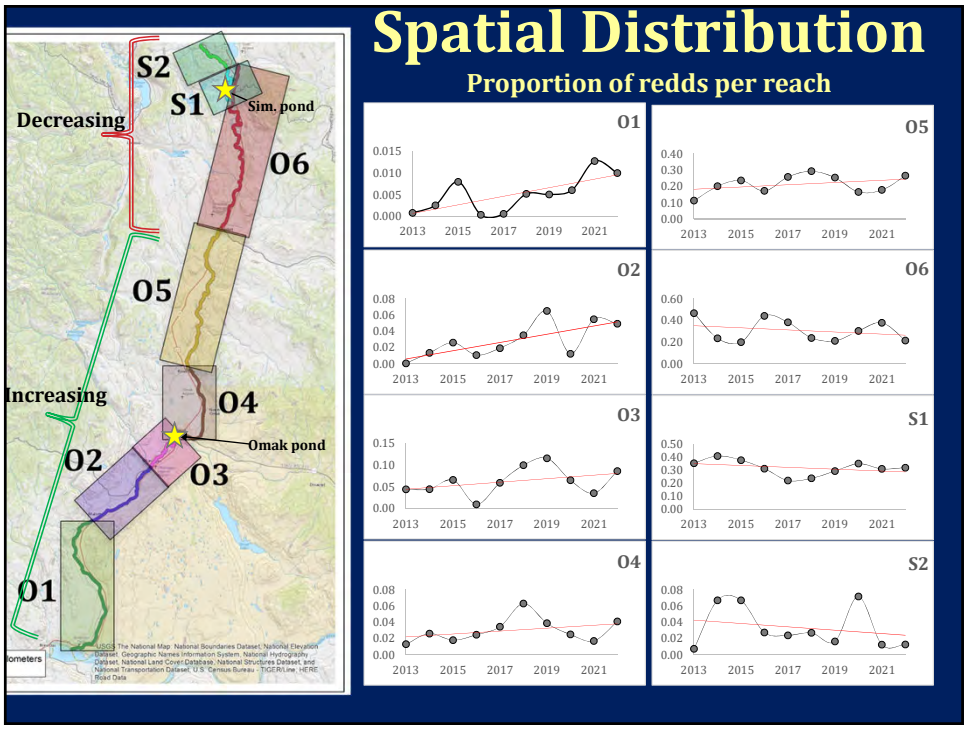
Annual Escapement

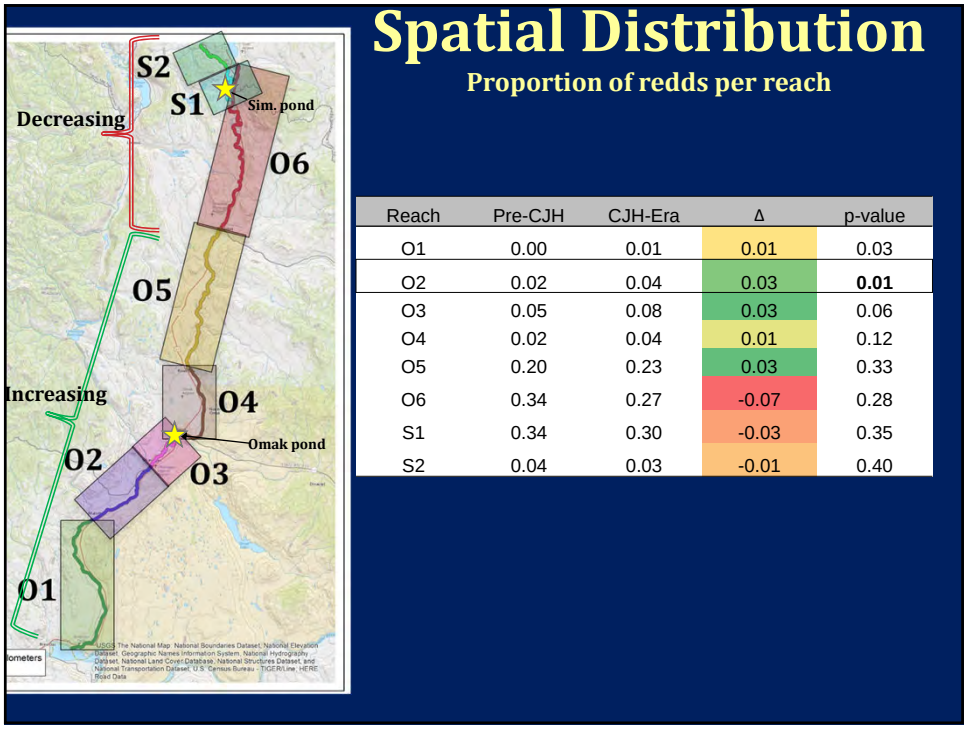


Spatial Distribution - Spawning

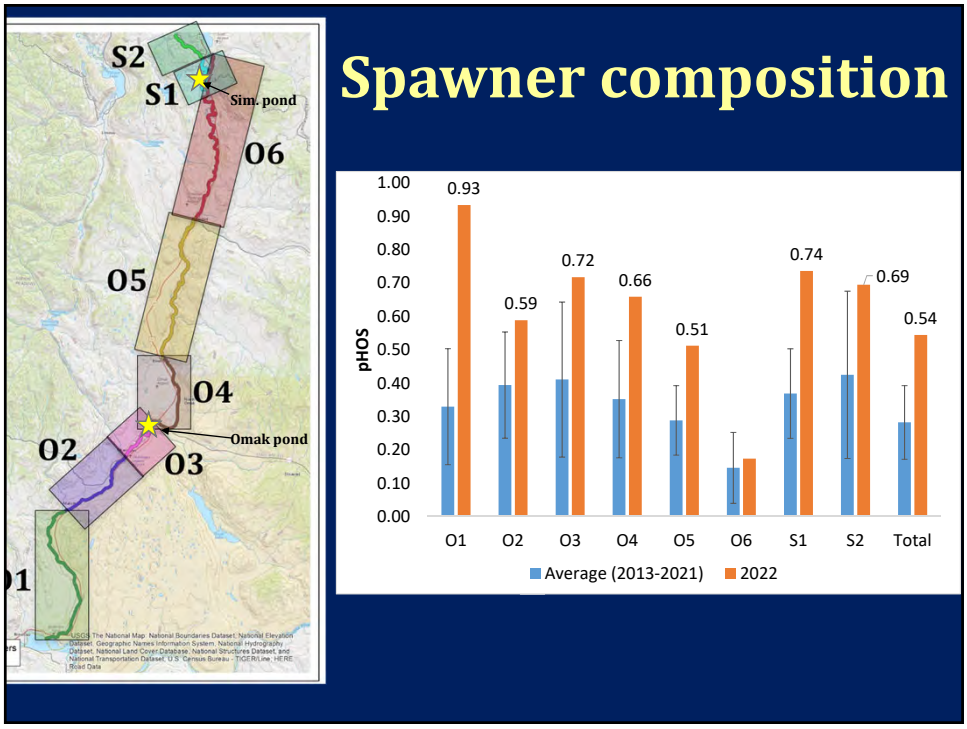



Spatial Distribution
S2
S1
Sim. pond
O6
80% of redds
O5
O4
Omak pond
O2
O3
O1
S2 1%
O1 1%
O2 5%
O3 9%
O4 4%
S1 32%
O5 26%
O6 22%

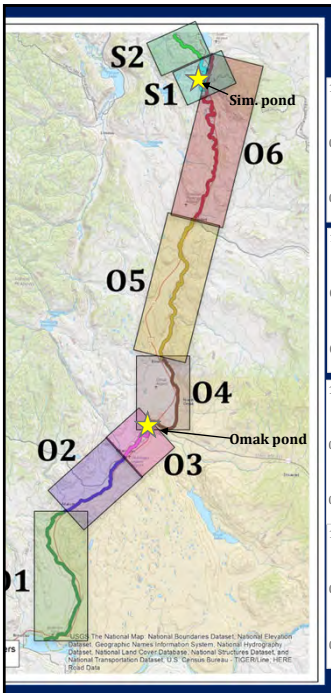

Spatial Distribution
Proportion of redds per reach
Decreasing
Increasing
S2
S1
Sim. pond
O6
O5
O4
Omak pond
O2
O3
O1
O1
O5
O2
O6
O3
S1
O4
S2
2013
2015
2017
2019
2021

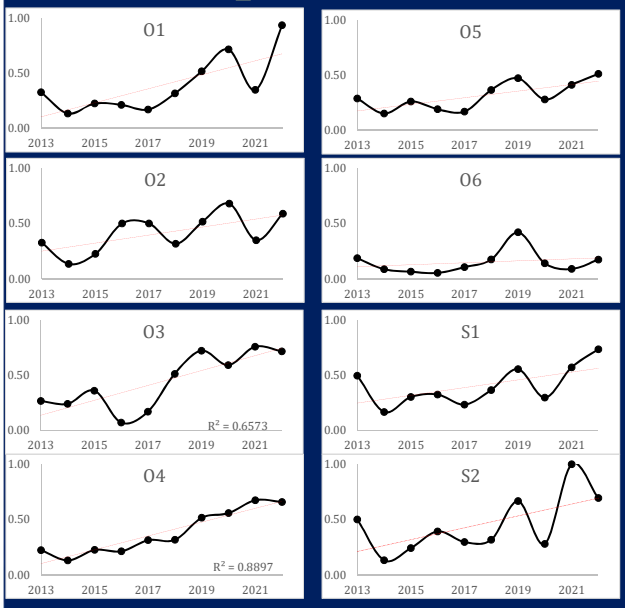


Reach	Pre-CJH	CJH-Era	Δ	p-value
O1	0.00	0.01	0.01	0.03
O2	0.02	0.04	0.03	**0.01**
O3	0.05	0.08	0.03	0.06
O4	0.02	0.04	0.01	0.12
O5	0.20	0.23	0.03	0.33
O6	0.34	0.27	-0.07	0.28
S1	0.34	0.30	-0.03	0.35
S2	0.04	0.03	-0.01	0.40

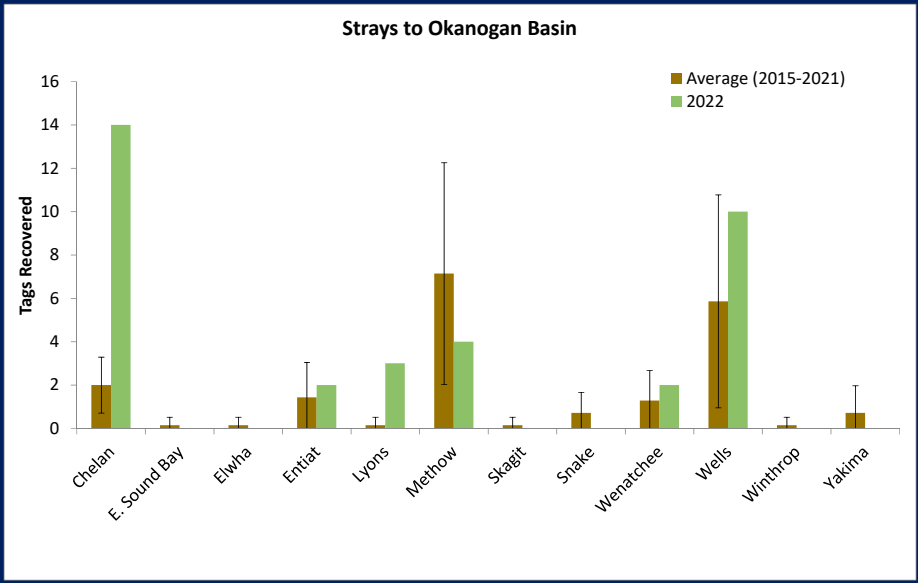


pHOS





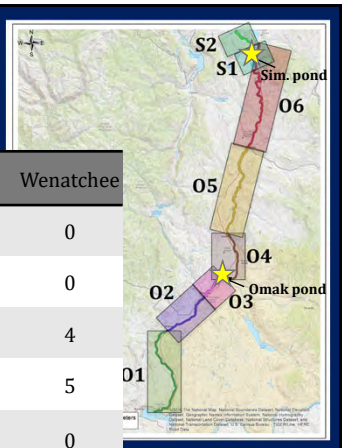
CWT Recoveries



Stray rate-into basin

(CWT-expansions)

Reach	Chelan	Methow	Salmon R.	Entiat	Wells	Wenatchee
O1	3	3	0	0	19	0
O2	47	0	0	0	0	0
O3	31	4	0	0	10	4
O4	10	5	0	5	13	5
O5	12	7	12	0	8	0
O6	0	0	4	4	0	0
S1	0	0	0	0	0	0
S2	0	2	0	0	0	0
Total	102	21	16	9	49	9
Percent of spawning	2.3%	0.5%	0.4%	0.2%	1.1%	0.2%



Strays comprise *4.7%* of spawning population

CJHP strays to out-of-basin

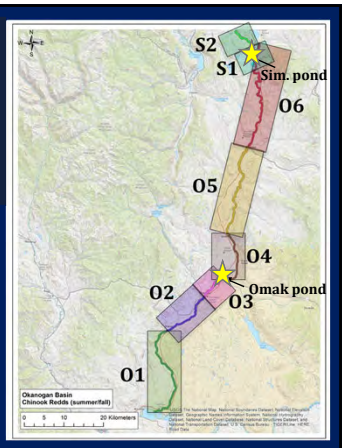
Year	Escapement	Chelan	Wenatchee	Methow	Okanogan	Similkameen	Homing	Straying
2014	1033	7	0	4	374	648	98.94%	1.06%
2015	2470	4	4	5	939	1518	99.47%	0.53%
2016	2585	4	0	4	365	2212	99.69%	0.31%
2017	857	11	0	0	510	336	98.72%	1.28%
2018	193	4	0	4	116	69	95.85%	4.15%
2019	1460	12	0	0	846	602	99.18%	0.82%
2020	2035	0	0	33	1083	919	98.38%	1.62%
2021	1688	4	4	15	713	952	98.64%	1.36%

*RMIS query data from February 2023

CJHP-origin returns to the Okanogan spawning grounds

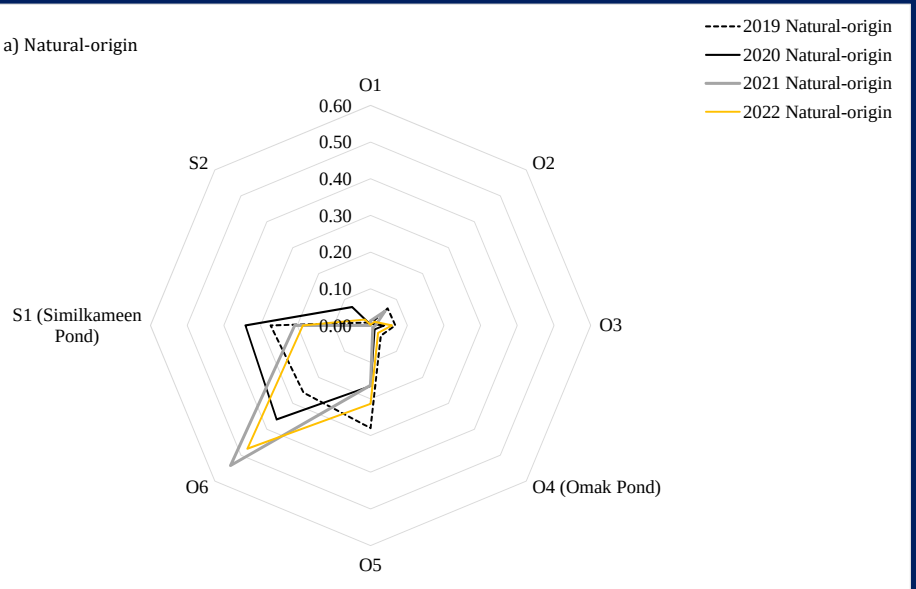
(CWT expansions)

Reach	CJH (seg)	Omak Pond (CJH Int.)	Similkameen Pond (CJH Int.)
O1	12	4	0
O2	8	72	0
O3	77	115	32
O4	0	82	0
O5	61	397	100
O6	37	51	70
S1	0	163	801
S2	68	4	33
Total	263	886	1036
Percent of spawning population	6.0%	20.2%	23.6%



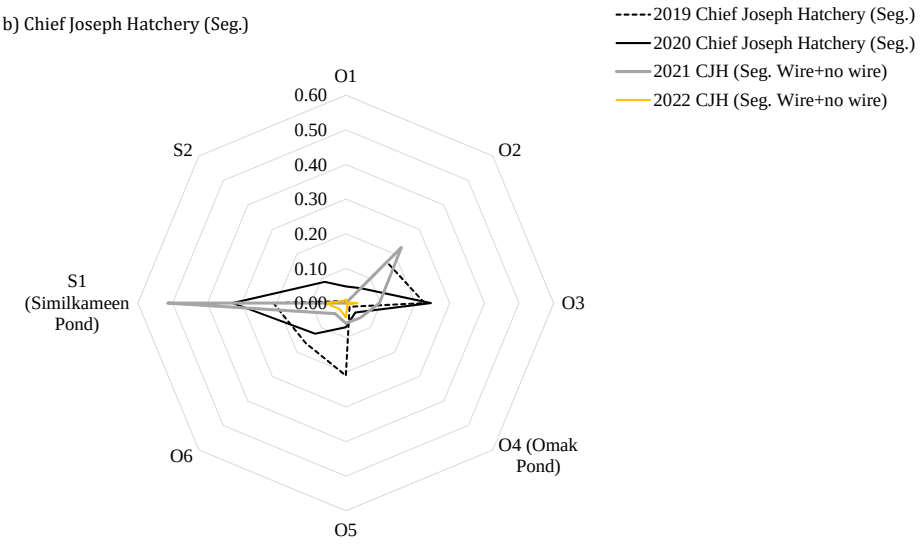
CJH-origin fish comprise *49.8%* of spawning population

Spawner distribution



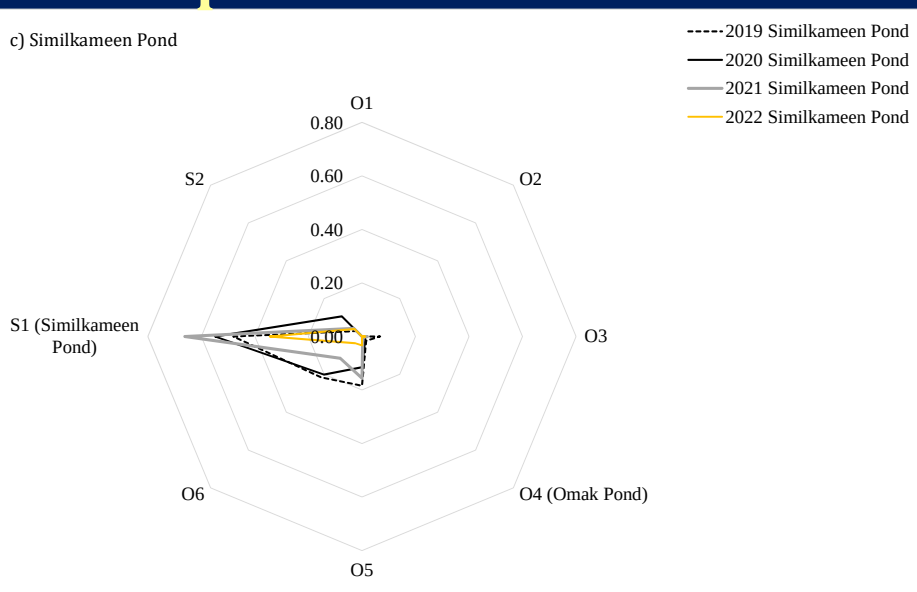
Spawner distribution

b) Chief Joseph Hatchery (Seg.)

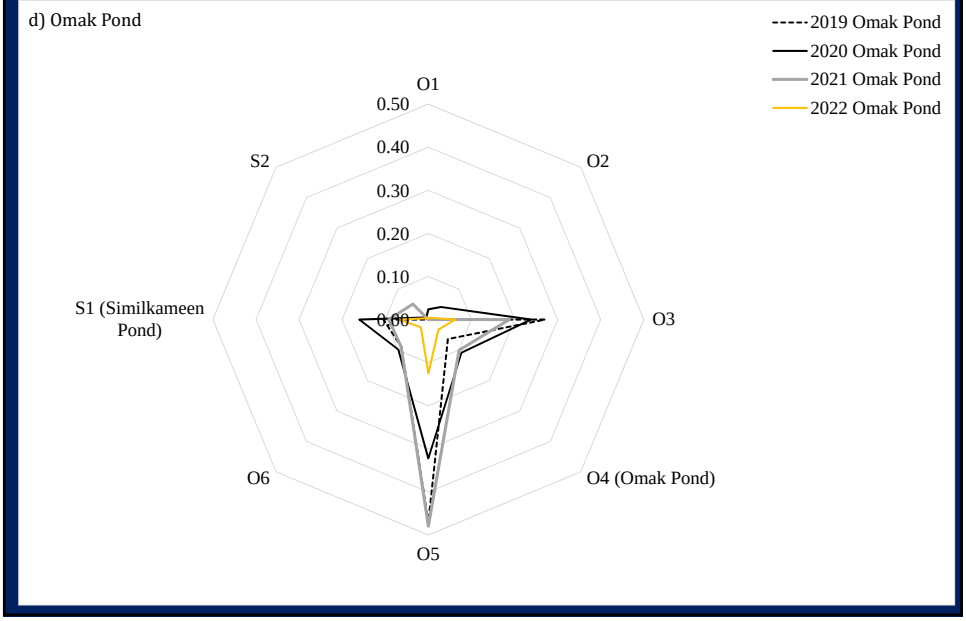


Spawner distribution

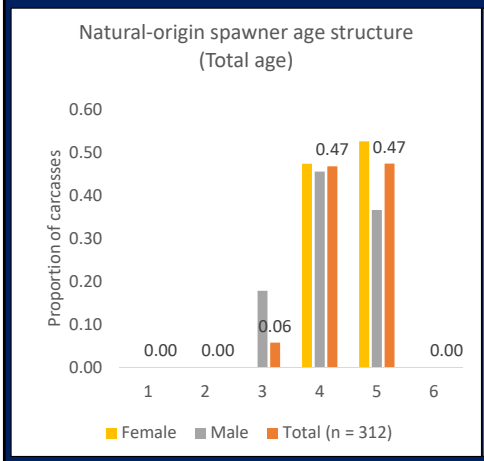
c) Similkameen Pond

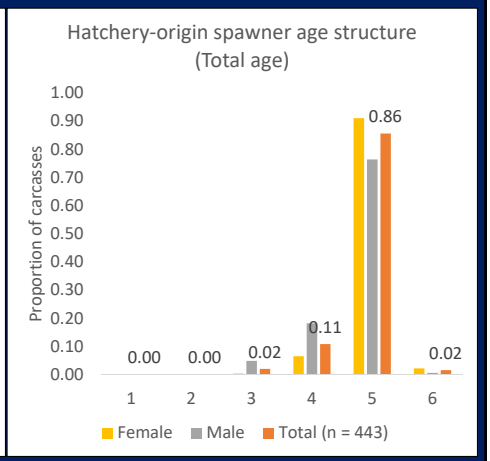


Spawner distribution



Age Structure



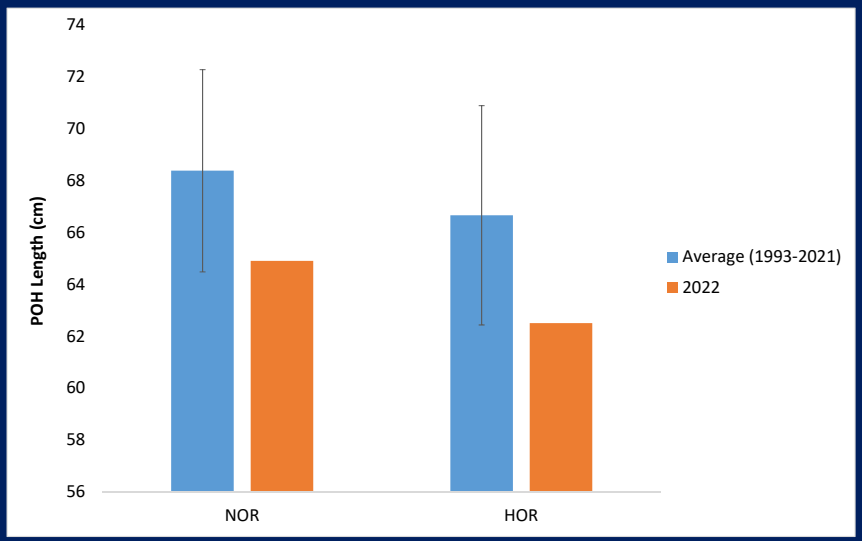


2022 Jacks

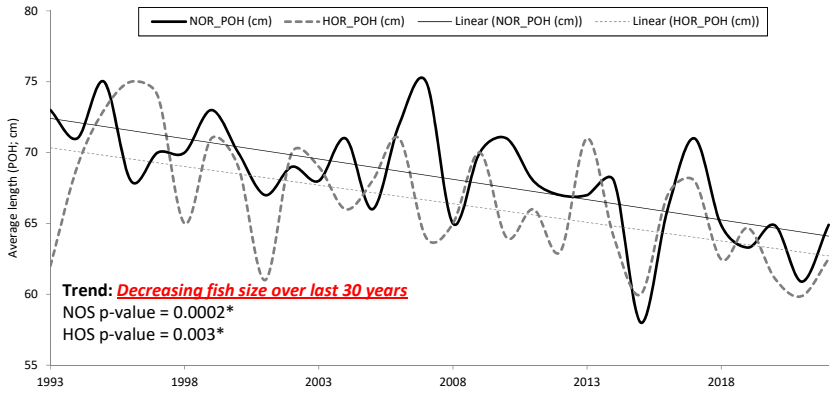
	Jacks	Adults	Total	Jack Rate
HOS	9	434	443	2.0%
NOS	18	294	656	5.8%

HOS Age Sample Rate 10.1%
NOS Age Sample Rate 7.1%

Fish size



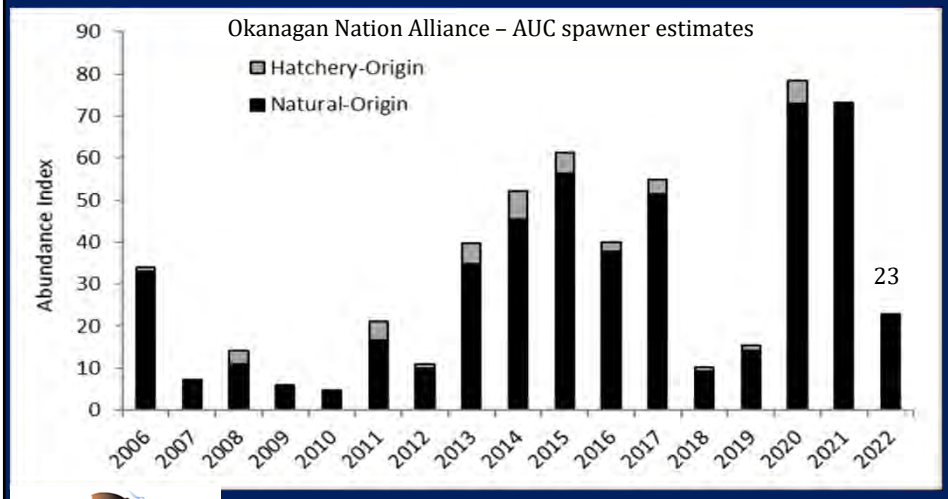
Length trend



Spawner Abundance
(USA portion of basin only)

2022	Redds	Spawners	HOS	NOS	pHOS
Okanogan	1467	2934	1320	1614	0.45
Similkameen	729	1458	1071	387	0.73
U.S. Total	2196	4392	2390	2002	0.54

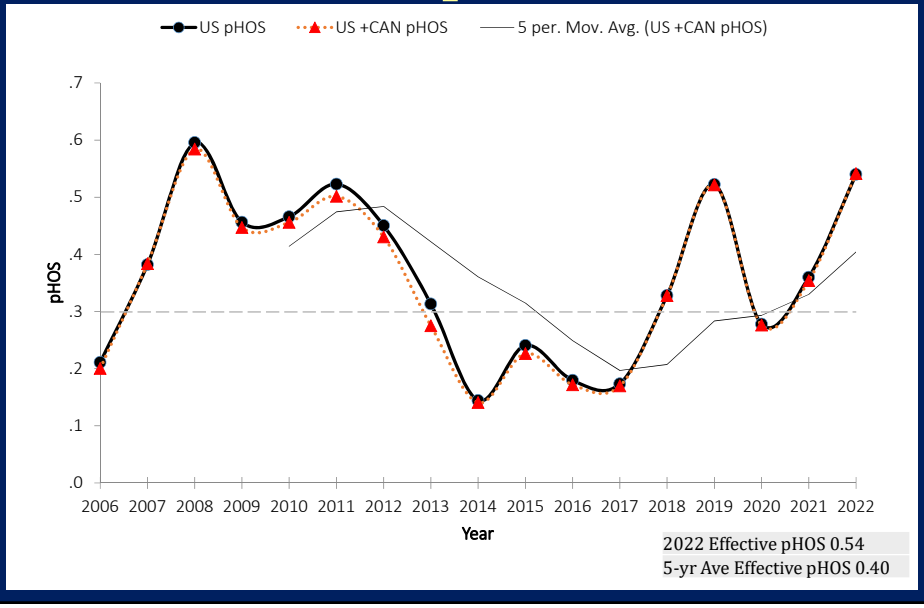
Chinook escapement to Canada



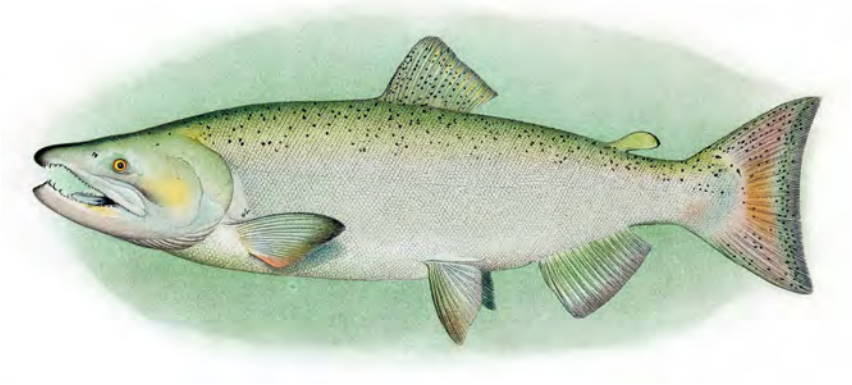
Okanagan Nation Alliance

Figure courtesy of Elinor McGrath, ONA

U.S. pHOS




Grant County
PUBLIC UTILITY DISTRICT
P.U.D.
CHELAN COUNTY
DOUGLAS COUNTY PUD
Okanagan Nation Alliance



Chief Joseph spring-Chinook M&E: §10(j) and segregated program

Kirsten Brudevold (CJHP M&E Fisheries Biologist)

Current monitoring efforts

1. PRD Run Escapement
   a) Run estimate
   b) Run composition
   c) Adult spatial distribution

1. Environmental DNA (eDNA) monitoring
   a) Spatial distribution (adults)
   b) Confirm successful spawning (juveniles)

2. Visual Surveys (redd & carcass)
   a) Redd counts (spatial extent)
   b) Carcass recoveries

3. Juvenile mark-recapture (OBMEP electro-fishing)
   a) Confirm successful spawning
   b) Juvenile population estimates
   c) Genetic analyses

PIT tags

2022 Run Estimate to Okanogan

Okanogan Run Estimate *(Provided by WDFW)*[1]

Origin	PITs	Estimated Fish	Proportion of Run
CJH Segregated	1	19	0.05
CJH Integrated (10j)	18	339	0.88
Natural Origin	1	27	0.07
Total	20	**385**	1.00

[1]Based on PIT tags from Priest Rapids tagging effort

Trends

Spring-Chinook Okanogan Run Estimate (*provided by WDFW*)

Based on Wells PITs (2014 – 2020) and Priest Rapids PITs (2021-2022)

Year	Hatchery Origin	Natural Origin	Unknown Origin	Run Estimate
2014	0	0	186	186
2015	0	0	204	204
2016	0	0	240	240
2017	0	0	653	653
2018	1401	73	0	1474
2019	518	14	0	532
2020	1592	55	0	1647
2021	2612	272	0	2884
2022[1]	**358**	**27**	**0**	**385**

[1]*Note: 2022 Hatchery Origin values comprised of*

- *339 10j Integrated (Riverside acclimation pond)*
- *19 CJH segregated*

Does not include returns to CJH

PIT tags

2022 Run Estimate to Okanogan

Spring-Chinook removals at CJH *(includes post-release mortality)*

Origin	Estimate
CJH Segregated	26
CJH Integrated (10j)	0
Natural Origin	0
Total	**26**

PIT tags

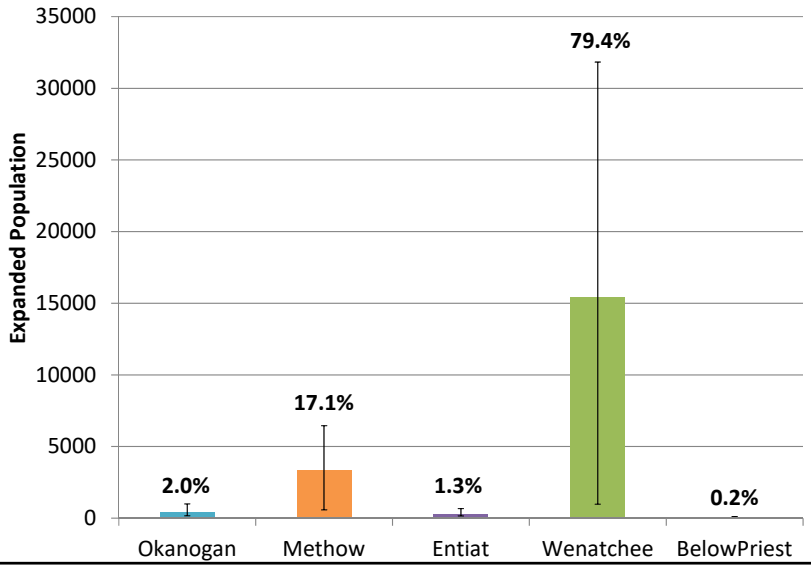
2022 Run Estimate to Okanogan

2022 end-of-season PIT estimate of Okanogan spring-Chinook to Bonneville and Wells Dam

	Brood Year	Age	PITs at BON	PITs at Wells	Mark rate	Expanded estimate to BON	Expanded estimate to Wells
CJH Segregated	BY17	5	0	0	1.72%	0	0
	BY18	4	2	1	3.80%	53	26
	BY19	3	1	0	0.55%	182	0
	Total		3	1		**235**	**26**
Okanogan 10j / Riverside	BY17	5	0	0	2.39%	0	0
	BY18	4	2	0	19.27%	10	0
	BY19	3	7	7	1.93%	363	363
	Total		9	7		**373**	**363**

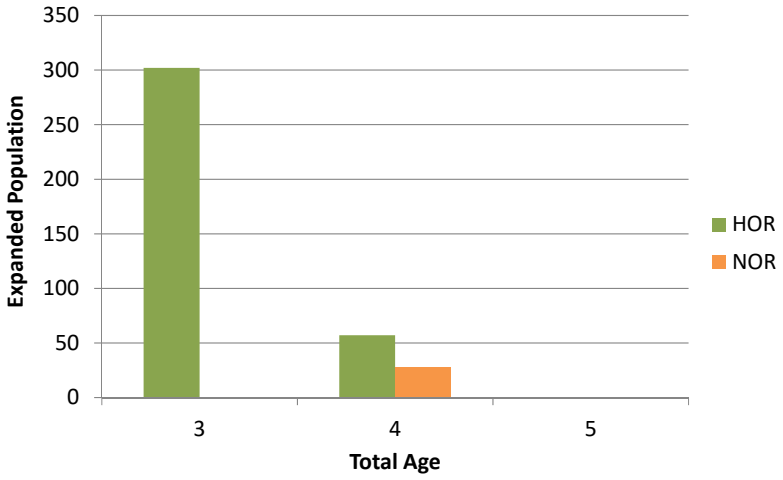
Adult PIT tagging

PRD Run Escapment Estimates



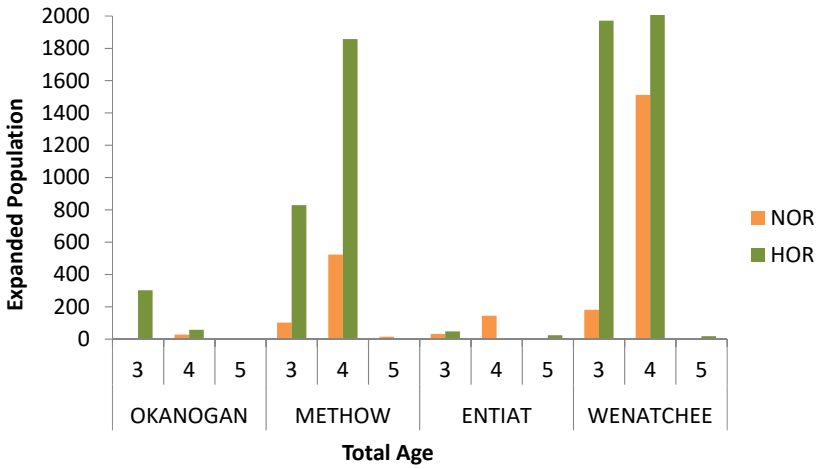
PIT tags

Okanogan Spring Chinook Age Structure

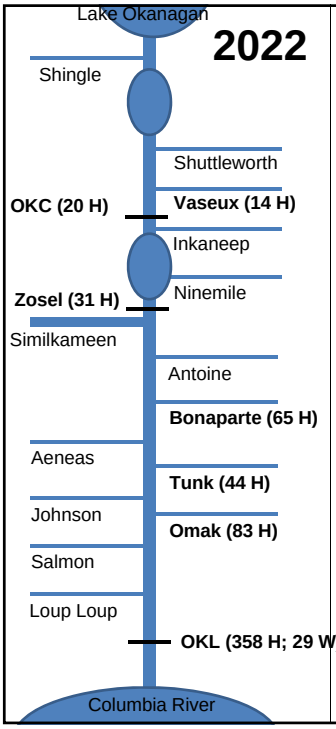


PIT tags

Upper Columbia Spring Chinook Age Structure



Adult PIT tags



Adult spring-Chinook returns to tributaries (last detections)

← Conceptual diagram of Okanogan Basin

- *(n)* indicates estimated adult spring-Chinook based on PIT expansions (for WDFW PRD tag group)
- Mostly 10j returns, with a few wild returns

eDNA Monitoring

eDNA – Evidence of successful reproduction

- Early detection, especially those tributaries that receive little visual survey effort
- 27 sites in tributaries
- 8 sites in mainstem Okanogan
- *Need for adding sites in Lake Okanagan tributaries*

Chinook eDNA –U.S. and Canada Tribs

eDNA Monitoring

Site	Jun 2012	Aug 2012	Oct 2013	Sep 2014	2015	Sep 2016	Sep 2017	Mar 2018	Sep 2018	Mar 2019	Sep 2019	Sep 2020	Mar 2021	Sep 2021	Mar 2022
US Tributaries															
Aeneas Creek (1)			-	-		-	+	-	-	-	-	+	-	-	-
Antoine Creek (2)			-	+		+	-	-	+	-	+	-	-	-	+
Bonaparte Creek (3)	-	+		-		-	+	-	+	-	-	-	-	-	-
Johnson Creek (5)								-	+	-	-	-	-	-	-
Loup Loup Creek (6)			-	+		+	+	-	+	+	+		-	-	-
Ninemile Creek (7)	-	-		-		+		-		-	-	-	-	-	-
Omak Creek (near mouth) (17)	+	+		+		+	+	-	+	-	+	-	-	-	-
Omak Creek (above falls) (16)	-	-				+	+	-	+	-	-	-	-	-	-
Omak Creek (Haily Creek Washout) (37)														+	
Omak Creek (Mission bridge) (18)											-	-	-	-	-
Salmon Creek (RKM 0.6) (19)											-	-	-	-	-
Salmon Creek (RKM 2.9) (20)											-	-	-	-	-
Salmon Creek (RKM 7.1) (21)	+	+		+		+	+	-	+	+	+	-	-	-	-
Salmon Creek (RKM 17.3) (22)											+	-	-	-	-
Salmon Creek (RKM 21.9) (23)											-	-	-	-	-
Salmon Creek (RKM 25.5) (24)											-	-	-	-	-
Siwash Creek (30)			+					-		-		-	-		
Tonasket Creek (31)			+			-		-		-		-	-		-
Tunk Creek (32)			-			+	+	-	+	-	+	-	-	-	-
Wanacut Creek (34)			-			-	+	-		-		-	-		-
Canada Tributaries															
Inkaneep Creek (4)	-	+		-		-	-	-			-				
Shatford Creek (27)								-			+				
Shingle Creek (Lower) (26)	-	+		+		-	+	-			-				
Shingle Creek (Upper) (25)								-			+				
Shuttleworth Creek (28)	-	-		-		-		-			-				
Vaseux Creek (33)	-	+		+		+	+	-			-				

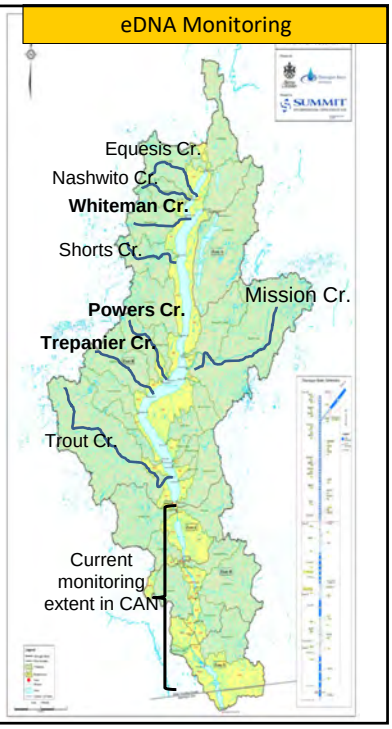
+	Chinook eDNA PRESENT
-	Chinook eDNA NOT DETECTED

Lake Okanogan Habitat

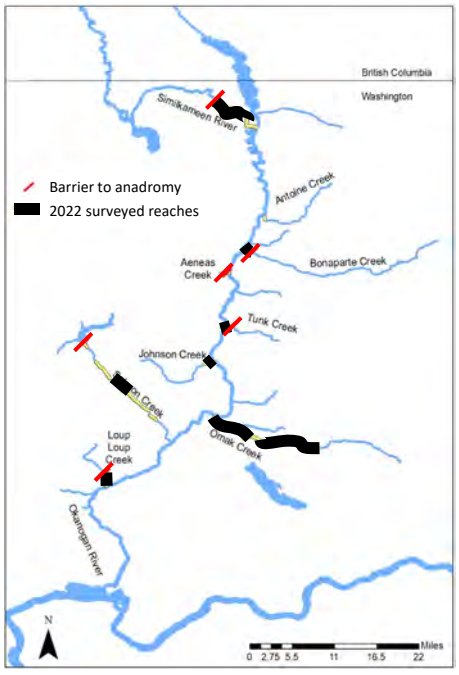
2020

- Whiteman Creek – 1 spring-Chinook observed
- Trepanier Creek – 1 spring-Chinook observed
- Powers Creek – 1 spring-Chinook carcass collected

eDNA Monitoring



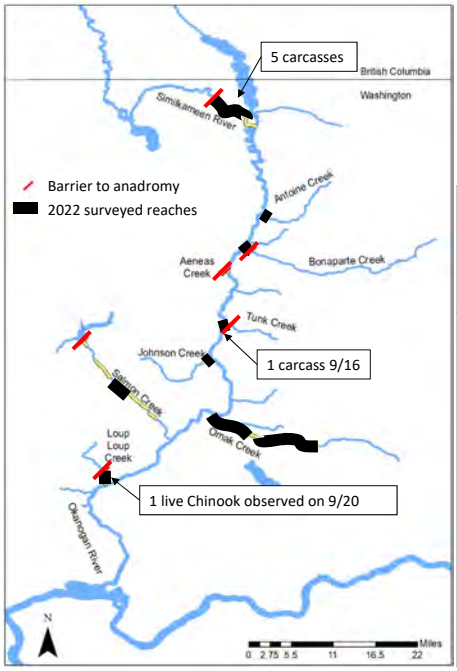
Visual redd & carcass surveys



Visual survey effort

Stream	Number of surveys	2022 Survey Date(s)
Aeneas Creek	1	8/18/2022
Bonaparte Creek	1	8/24/2022
Johnson Creek	1	8/22/2022
Loup Loup Creek	1	8/23/2022
Omak Creek	1	8/17/2022
Salmon Creek	1	8/29/2022
Similkameen River	4	8/3 - 8/25/2022
Tunk Creek	1	8/18/2022

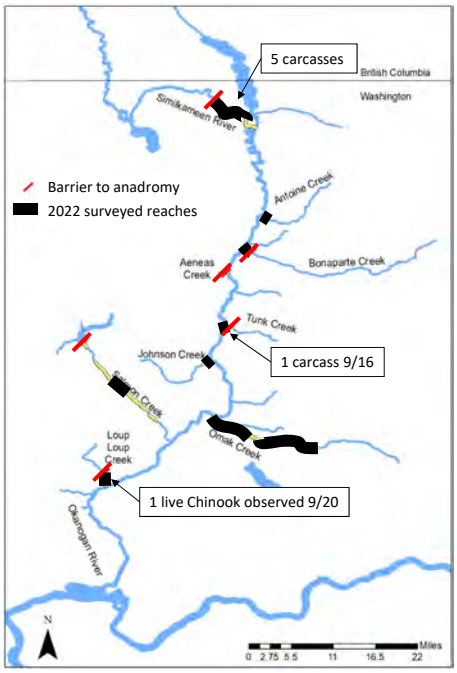
Visual redd & carcass surveys



Visual Survey Results

Stream	Redds	Carcasses Recovered	Live Fish Observed
Loup Loup Creek	0	0	1
Similkameen River	0	5	0
Tunk Creek	0	1	0

Visual redd & carcass surveys



Visual Redd Surveys

Take home for 2022:

- 11 visual surveys (Aug 3 – Aug 29)
- Recovered 6 carcasses
  - Results here….
- 1 live Chinook observed

Visual redd & carcass surveys

Carcass recoveries

Recovery Date	Recovery Site	Run	Origin
Aug 3	Similkameen River-S2	Summer	Wild
Aug 3	Similkameen River-S2	Summer	Hatchery
Aug 19	Similkameen River-S2	Summer	Hatchery
Aug 19	Similkameen River-S1	Summer	Hatchery
Aug 25	Similkameen River-S2	Summer	Hatchery
Sep 16	Tunk Creek	N/A	Hatchery

Juvenile mark-recapture (OBMEP electro-fishing)

OBMEP Tributary Surveys

- Tributary mark-recapture (electro-fishing) effort to determine outmigrant and population estimates for steelhead
- Occasionally encounter spring-Chinook
- Most suitable USA tributaries
- Several CAN tributaries surveyed by coordination with ONA

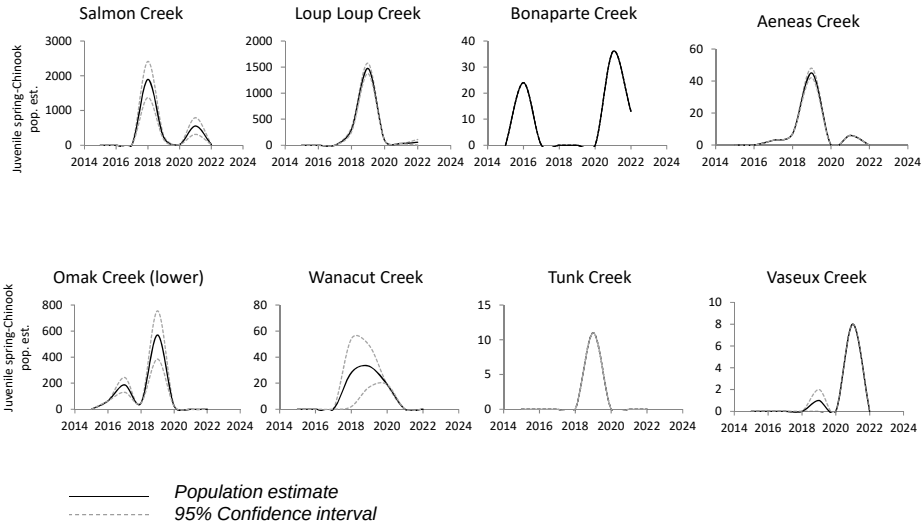
Juvenile mark-recapture (OBMEP electro-fishing)

OBMEP Tributary Surveys

Stream	Mark-Recapture Pop. Est.
Salmon Cr	20 ± 0
Lower Omak Cr	0
Upper Omak Cr	0
Loup Loup Cr	57 ± 53
Ninemile Cr	0
Bonaparte Cr	13 ± 0
Tonasket Cr	0
Tunk Cr	0
Aeneas Cr	0
Wanacut Cr	0
Johnson Cr	Not Sampled
Antoine Cr	15 ± 0
Wildhorse Sp Cr	Not Sampled
Shingle Cr	No Data Available
Inkaneep Cr	No Data Available
Shuttleworth Cr	No Data Available
Vaseux Cr	No Data Available

Juvenile mark-recapture (OBMEP electro-fishing)

OBMEP Tributary population estimates



Genetic analyses (PBT, GSI, Siblingship)

2018: 71 samples from juvenile Chinook in tributaries

- All samples assigned as spring-Chinook
- Highly related offspring, representing approx. ~20 spawners

2019: 32 samples from juvenile Chinook in tributaries

- All but 1 from the spring run lineage (mostly from the upper Columbia spring GSI group)
- Effective spawner size (NE) was 17 (95%CI 10 – 35)

Genetic analyses (PBT, GSI, Siblingship)

2020: 16 samples, all but 1 failed to genotype due to low quality tissue

2021: 8 samples, all but 2 failed to genotype due to low quality tissue

2022: New sampling method, only 1 sample collected, did not analyze

Take home

- Increasing trends in Adults (PITs) from 2014 to 2021 but drop in 2022
- Very few redds or carcasses in tributaries during visual surveys
- Juveniles present/successful reproduction – esp. 2018/2019
- Further methodological refinements necessary to increase accuracy of estimates

Appendices

Historic Timeline for Chief Joseph Hatchery Program

The Funding Decision for Planning

- **In December 2001,** as part of the solicitation associated with the Columbia Cascade Province, the Colville Tribes submitted a series of seven new proposals to address habitat restoration; fish propagation; fish harvest; and research, monitoring, and evaluation needs in the Okanogan subbasin.

- **In October 2002** the NWPCC recommended a total of four new proposals that included two of the original series of seven new proposals submitted by the Colville Tribes -- Proposal #29040 *Develop and Propagate Local Okanogan River Summer/Fall Chinook* and proposal #29033 *Design and Conduct Monitoring and Evaluation Associated with the Re-establishment of Okanogan Basin Natural Production.* The proposals were consolidated into one project titled *Chief Joseph Dam Hatchery Program (*Project # 2003-023-00).

- **In April 2003,** Bonneville agreed to fund development of the CJHP Master Plan and in July 2003, Bonneville negotiated a contract with the Colville Tribes to develop a CJHP Master Plan.

Completion of the Major Project Review Process (The Three-Step Review)

Step 1 – Conceptual Phase (Master Plan)

- **On May 26, 2004,** the Colville Tribes submitted the Master Plan. The spring Chinook components in the Master Plan were presented in a single separate chapter, all costs and facility requirements were presented as separate components. NWPCC staff determined that the inclusion of this additional information at the Step 1 Master Plan stage benefited both plan reviewers and decision-makers.

- **On June 9, 2004,** the NWPCC supported the staff recommendation that the spring Chinook component of the submitted CJHP Master Plan be reviewed by the ISRP.

- **On January 12, 2005,** the ISRP provided the NWPCC with its review of the CJHP Master Plan (ISRP Document 2005-02). The ISRP comments generally confirmed the content and the basis of the master plan for both the summer/fall and spring Chinook components, including support for the proposed research projects (i.e., a radio telemetry study to better understand the migration and spawn timing of the Okanogan summer/fall Chinook, and a study to test and develop live-capture, selective fishing gear for collection of local broodstock). The ISRP suggested revising the master plan to accommodate its comments. The ISRP raised issues that needed to be addressed as the project proceeded in its development. In summary, six issues were raised:
    1. A specific time frame process (i.e., decision tree) that outlines the expected range of the production scenarios
    2. Additional discussion on the proposal as it relates to alternative forms of mitigation
    3. Additional detail regarding the proposal and the relationship to the BAMP (Biological Assessment and Management Plan)
    4. Better integration with other NWPCC and basinwide documents (i.e., subbasin plans)
    5. Basic information regarding the in-basin and out-of-basin assumptions concerning survival, and

6. More detail on methods, designs (including controls), and hypotheses in the monitoring and evaluation plan

- **On March 15, 2005,** the NWPCC approved the Step 1 review of the *Chief Joseph Hatchery Program*, Project # 2003-023-00 and recommended conditions associated with Step 2. The specific language associated with the recommendations and approved budget was as follows:
    - The NWPCC approved the CJHP Step 1 Master Plan, including the spring Chinook component and the two research studies.
    - The NWPCC recommended that the Step 2 submittal include estimated costs, including a value engineering review. The submittal should also provide detail of any cost-share opportunities identified with the Bureau of Reclamation, public utility districts and irrigation districts.
    - The NWPCC recommended that additional information be included in the Step 2 submittal that fully addresses the issues raised by the ISRP.

Step 2 – Progress Review/Preliminary Phase

- **On November 12, 2007,** the Colville Tribes submitted the Step 2 documents addressing the conditions placed on this project as part of the Step 1 NWPCC decision. In addition, the Step 2 review included environmental review and preliminary design of the facility and out-year costs.

- **On March 7, 2008,** the ISRP provided its preliminary review (ISRP document 2008-2) of the Step 2 submittal. The ISRP requested additional information from the project sponsors including recommendations and modeling results from the Hatchery Scientific Review Group and a revision of the Master Plan to address issues raised in the ISRP's Step 1 and Step 2 reviews. The ISRP found that the Master Plan's primary deficiency was a lack of adequate linkage between the environmental assumptions and the objectives of the program. The ISRP thought the HSRG's new modeling capabilities would provide reasonable estimates of natural and hatchery recruitment consistent with limitations on habitat carrying capacity, hydrosystem operations, and downstream and marine harvest.

- **On July 3, 2008,** the Colville Tribes submitted its response to the ISRP's preliminary Step 2 review. The ISRP determined that additional detail was still needed to address the issues raised by the ISRP. The additional information was provided to the ISRP in August and November 2008 to complete the submittal for review.

- **On January 22, 2009,** the ISRP provided a "response requested" review (ISRP document 2009-2). The ISRP found that two of the six Step 1 issues were resolved, but four issues still required further attention before the ISRP could judge whether the project met scientific review.

- **On March 2, 2009,** the ISRP and the Colville Tribes met to discuss the recent ISRP review. The meeting provided an opportunity for the Colville Tribes to seek clarification of the ISRP's concerns, and on March 11, 2009, the Colville Tribes provided additional modeling results and other information sought by the ISRP.

- **On April 17, 2009,** the ISRP provided its final Step 2 review (ISRP 2009-12). The ISRP found that the Step 2 submittal "meets scientific review criteria." The ISRP stated that the Chief Joseph Hatchery Master Plan had progressed significantly from the Step 1 and earlier Step 2 plans. The

ISRP was impressed by the Colville Tribes' efforts to address the issues and their use of modeling to assist them in making plan refinements reflecting the best practices of the Fish and Wildlife Program and the Hatchery Scientific Review Group. The ISRP cautioned however that much uncertainty remains as to whether the salmon harvest and conservation goals could be reached. The scientists stressed the need for an adequate monitoring and evaluation (M&E) plan to address the uncertainties and to adaptively manage the CJHP.

- **On May 12, 2009** the NWPCC approved the Step 2 review of the Chief Joseph Hatchery Program and recommended with conditions the activities associated with Step 3. The specific action taken by the NWPCC is as follows:

    - That the NWPCC recommend that the Chief Joseph Hatchery Program proceed to Step 3-level activities.
    - That the NWPCC call for additional information to be developed that fully addresses the issues raised by the independent peer review for consideration during the Step 3 review.

Step 3 – Detailed/Final Phase and Final Science Review

- **On November 5, 2009,** the Colville Tribes briefed the ISRP and NWPCC staff on the Tribes' draft monitoring and evaluation (M&E) plan for the CJHP. In addition, the Colville Tribes provided an update of the progress made in the selective fishing research and development of a weir for the Okanogan River, as recommended by the ISRP. As part of this briefing the ISRP provided helpful comments on the M&E plan, and the Colville Tribes anticipated that the M&E plan for the Step 3 review submittal would be finalized in the near future.

- **On November 16, 2009** the NWPCC received the revised M&E plan. The submittal included the summer/fall Chinook and spring Chinook components addressing hatchery production, harvest and natural production. The submittal is intended to initiate the Step 3 review and address the issues identified by the ISRP in its final Step 2 review (ISRP document 2009-12).

- **On January 6, 2010** the NWPCC received the ISRP's review of the M&E plan. The ISRP found that the plan met scientific review criteria. The ISRP found that the essential decision framework associated with the M&E plan is based on the best available scientific information, applies state-of-the-art analytical tools, and reflects the scientific principles and standards of the NWPCC's Program and the Hatchery Scientific Review Group. The ISRP's comments evidenced an appreciation for the "healthy and helpful exchange" with the Colville Tribes as the CJHP Master Plan moved through the step review process. This relationship led to useful adaptation as the project moved through the step-review process, and is reflected in the extensive comments made by the ISRP in its final review. It is evident that the ISRP and the Colville Tribe appreciate the trust and respect of their interactions.

Environmental Review and Endangered Species Act

- **In May 2007,** the Draft Environmental Impact Statement (EIS) for the Chief Joseph Hatchery Program was published in the Federal Register. Public hearings on the draft EIS were held in June, 2007. The U.S. Army Corps of Engineers became a National Environmental Policy Act (NEPA) Cooperating Agency in April, 2008, since the hatchery is proposed on their land.

Final Design

- **The final designs were completed in November of 2009.** Documents were provided to the NWPCC in early April 2010 as part of the step-review process. The design included proposed new construction of an incubation and rearing facility to accommodate the summer/fall Chinook (2,000,000) and spring Chinook (900,000 yearling smolts) programs, provide adult holding facility, and an administrative office. There also will be four houses constructed for the employees on Washington Parks and Recreation Commission land. In addition, along the Okanogan River, three existing Oroville-Tonasket Irrigation District irrigation ponds, one tribe-owned acclimation pond, and two new ponds will be modified and/or constructed to acclimate, imprint, and volitionally release approximately 1.3 million summer/fall and spring Chinook smolts annually.

Construction Start-up

- **On March 19, 2010** construction bids were received, however finishing Corps of Engineers' 408 Review on effects to CJ Dam delayed the actual hatchery construction until 2011. Phased construction started with construction of hatchery housing and acclimation ponds in 2010.

Operational Start-up

- **In September 2013,** the hatchery was dedicated and initial operations started in Fall of 2013. CJHP staff began collecting broodstock for releases of subyearlings in 2014 and yearlings in 2015 and quickly ramped up smolt release numbers to more than two million (including spring Chinook).

- **First Release of Sub Yearling S/F Chinook (Brood Year 2013)**
    - May 2014

- **First Release of Yearling S/F Chinook (Brood Year 2013)**
    - April 2015

- **First Release of Yearling Spring Chinook (Brood Year 2013)**
    - April 2015

- **First Adult Returns of S/F Chinook releases from CJH and Acclimation Ponds**
    - June-October 2018

- **First Adult Returns from Yearling Spring Chinook releases at CJH and Riverside Pond**
    - May-June 2018

Glossary of Terms and Variables

The following is a list of key terms and variables used in the CJHP:

- HOS = the number of hatchery-origin fish spawning naturally.
- NOS = the number of natural origin fish spawning naturally.
- NOB = the number of natural-origin fish used as hatchery broodstock.
- HOB = the number of hatchery origin fish used as hatchery broodstock.
- HORs = hatchery-origin recruits. The number of HORs equals the sum of HOS + HOB + hatchery-origin fish intercepted in fisheries.
- NORs = natural origin recruits. The number of NORs equals the sum of NOB, + NOS + natural-origin fish intercepted in fisheries.
- pHOS = proportion of natural spawners composed of HORs. Equals HOS/(NOS + HOS).
- pNOB = proportion of hatchery broodstock composed of NORs. Equals NOB/(HOB + NOB)
- PNI = proportion of natural influence on a composite hatchery-/natural-origin population. Can also be thought of as the percentage of time the genes of a composite population spend in the natural environment. Equals 1 - pNOB/(pNOB + pHOS).
- SAR = smolt to adult return.

Chief Joseph Hatchery Production Plan

Brood Year: 2023
Species: Summer Chinook
Stock: Okanogan
Origin: Wild
Program: Integrated

Planting Goal: 1,100,000
Pounds: 86,000

Egg Take Goal: 1,485,000

Adult Goal: 656
Assumed Fecundity *5,000*
Average Fecundity (BY17-BY22) *4,037*

Estimated Release Data:

Start Date:	End Date:	Num Released	fish per lb.	Wt. grams	Total weight (lb.)	Total weight (kg)	Life Stage	Release Site	Mark Type	Tagged
05/15/24	06/01/24	300,000	50.0	9.1	6,000	2,722	Sub-Yearlings	Omak	Ad Clipped	100% CWT
04/15/25	04/30/25	400,000	10.0	45.4	40,000	18,144	Yearlings	Similkameen	Ad Clipped	100% CWT
04/15/25	04/30/25	400,000	10.0	45.4	40,000	18,144	Yearlings	Omak	Ad Clipped	100% CWT

Notes:
Egg take goal includes 3% for culling.
Adult Goal includes 10% pre-spawn mortality
10% Green to Eyed egg mortality
Rearing mortality 10.7% for all groups

Rearing Summary:

Species	Source	Date	Number Green Eggs	Number Eyed Eggs	Number Ponded	Fed Fry	Released	Location
EA SU Chinook Sub	Okanogan	June	392,850	353,565	335,887	319,092	300,000	Omak
EA SU Chinook YR	Okanogan	April	523,800	471,420	447,849	425,457	400,000	Similkameen
EA SU Chinook YR	Okanogan	April	523,800	471,420	447,849	425,457	400,000	Omak

Chief Joseph Hatchery Production Plan

Brood Year: 2023
Species: Summer Chinook
Stock: Okanogan
Origin: Hatchery
Program: Segregated

Planting Goal: 900,000
Pounds: 58,000

Egg Take Goal: 1,240,000

Adult Goal: 552
Assumed Fecundity *5,000*
Average Fecundity (BY17-BY22) *3,860*

Estimated Release Data:

Start Date:	End Date:	Num Released	fish per lb.	Wt. grams	Total weight (lb.)	Total weight (kg)	Life Stage	Release Site	Mark Type	Tagged
05/15/24	06/01/24	400,000	50.0	9.1	8,000	3,629	Sub-Yearlings	CJ Hatchery	Ad Clipped	100k CWT
04/15/25	04/30/25	500,000	10.0	45.4	50,000	22,680	Yearlings	CJ Hatchery	Ad Clipped	100k CWT

Notes:
Egg take goal includes 5% for culling.
Adult Goal includes 10% pre-spawn mortality
10% Green to Eyed egg mortality
Rearing mortality is 9.7% for yearlings, 11.7% for sub-yearlings.

Rearing Summary:

Species	Source	Date	Number Green Eggs	Number Eyed Eggs	Number Ponded	Fed Fry	Released	Location
EA SU Chinook Sub	Okanogan	June	530,100	477,090	453,236	430,574	400,000	CJ Hatchery
EA SU Chinook YR	Okanogan	April	647,900	583,110	553,955	526,257	500,000	CJ Hatchery

Chief Joseph Hatchery Production Plan

Brood Year: 2023
Species: Spring Chinook
Stock: CJ Hatchery
Origin: Hatchery

Planting Goal: 700,000
Pounds: 46,667

Egg Take Goal: 1,094,400

Adult Goal: 640
Assumed Fecundity *3,800*
Average Fecundity (BY17-BY22) *3,320*

Estimated Release Data:

Start Date:	End Date:	Num Released	fish per lb.	Wt. grams	Total weight (lb.)	Total weight (kg)	Life Stage	Release Site	Mark Type	Tagged
04/15/25	04/20/25	700,000	15.0	30.2	46,667	21,168	Yearlings	CJ Hatchery	Ad Clipped	200k CWT

Notes:
Egg take goal includes 20% for culling.
Adult Goal includes 10% pre-spawn mortality
10% Green to Eyed egg mortality
Rearing mortality is 6.5%

Rearing Summary:

Species	Source	Date	Number Green Eggs	Number Eyed Eggs	Number Ponded	Fed Fry	Released	Location
Spring Chinook	CJH Ladder	April	875,520	787,968	748,570	711,141	700,000	CJ Hatchery

Chief Joseph Hatchery Production Plan

Brood Year: 2023
Species: Spring Chinook
Stock: Met Comp
Origin: Hatchery/Wild

Planting Goal: 200,000
Pounds: 13,333

Egg Take Goal: 326,800

Adult Goal: 190

Estimated Release Data:

Start Date:	End Date:	Num Released	fish per lb.	Wt. grams	Total weight (lb.)	Total weight (kg)	Life Stage	Release Site	Mark Type	Tagged
04/15/25	04/30/25	200,000	15.0	30.2	13,333	6,048	Yearlings	Riverside Pond	None	100% CWT

Notes:
Egg take goal includes 20% for culling.
Adult Goal includes 10% pre-spawn mortality
10% Green to Eyed egg mortality
Rearing mortality is 10.5%

Rearing Summary:

Species	Source	Date	Number Green Eggs	Number Eyed Eggs	Number Ponded	Fed Fry	Released	Location
Spring Chinook	Winthrop NFH	April	261,440	235,296	223,531	212,355	200,000	Riverside

2022 CJHP APR Meeting Summary

Day 1 and Day 2

Tuesday March 29, 2022

Wednesday March 30, 2022

12th Annual
Chief Joseph Hatchery Program Review (APR)
2022 Meeting Summary
DRAFT

DAY 1 – Tuesday, March 29

Attendees: See attached attendance list.

Part 1 – Program Overview (Packet Pages 1-10)

9:00 – 9:10 **Call Procedures etc.**

9:10 – 9:30 **Welcome Message & Participant Appreciation.** *Casey Baldwin, CCT; MEI*

Part 2 – Data Analysis and Presentation: 2021 Year-in-Review (Packet Pages 11-21)

9:30 – 9:45 **Population Status presentation.** *Andrea Pearl, CCT*

Questions/comments – Population Status presentation

- John Arterburn - How much of the fish redistribution to Reach O2 is avoidance of the weir/trap vs actual redistribution?
- Andrea Pearl - Some fish were observed upstream of weir in addition to downstream of the weir and PIT detections at the OKL array were after the weir was removed. The trend in redd utilization is that redds are built later in the season using the lower basin. Aerial surveys show utilization early in the season is in the upper basin, and in the lower basin later in the season.
- John Arterburn - Fish used to use that area more than 10 years ago. It's good to see they're coming back.
- Todd Pearsons - Do you have an idea about the influence of marine vs. freshwater driving variation in productivity? Are they reaching density dependence?
- Andrea Pearl -We haven't made direct comparisons about marine vs fresh water. We are seeing superimpositions on the upper spawning grounds, where redds are built on top of other redds, which could decrease juvenile survival.
- Matt Laramie - We are starting to look at some return and screw trapping numbers to see where the changes in productivity are happening.

Part 3 – Review Operating Hypothesis (Packet Pages 22-45)

9:45– 10:05 **Review Management Framework.** *Casey Baldwin, CCT; MEI*

- *Logic Path: Program Goals → Management Policy → Projected Outcomes*
- *Review 2021 ISIT updates: Override tool, adjustments to broodstock management and terminal harvest after July 15th Wells Dam counts were available*
- *2021 Outcomes versus Management Targets/ Plans for 2022*

Questions/comments – Logic Path presentation

- Todd Pearsons - Do you think that the magnitude of the selective harvest could influence evaluations of hatchery vs wild phenotypic comparisons? Do you have double index tag (DIT) groups or an alternative method to evaluate this possibility?
- Casey Baldwin - The overall exploitation rate difference was about 20 percent. I don't know if that's enough difference to remove individuals who might influence our conclusions about phenotypic variation. We know harvest methods are both size and age selective. If we lose larger or older hatchery fish, then that could affect those comparisons.
- Todd Pearsons - We have DIT groups at Priest Rapids. We haven't seen differences due to the fishery.
- Casey Baldwin - The majority of the selective pressure happens above Priest for Summer Chinook, but it is harder to detect for fall Chinook.

Part 4 – Data Analysis and Presentation: 2021 Year-in-Review (Packet Pages 46-129)

10:05 – 10:50 **Harvest Program and Hatchery Surplus – Year-in-Review, 2021 Data Review & Analysis**. *Isaiah Martin, CCT; Brian Dietz, CCT* (Packet Pages 47-59)

- *Harvest program (creel and purse seine) and hatchery ladder results (20 min)*

Questions/comments – Harvest/Hatchery Surplus presentation

- Casey Baldwin - Birds of Prey Raptor Center needed fish to feed a higher number of rescued birds. This met with the tribe's ethics goals, and was a good source for fish removed from the system rather than taking them to the dump. This may be a way to use excess fish in the future, but the number of birds this year might have been greater than normal.
- Bill Gale - I am unclear on the Icicle Creek results. LNFH only releases 200K out of 1.2 M fish that are ad clip/CWT, and the remainder are ad clip only. How is it possible only 8 percent of your catch were ad clip only with no CWT?
- Brian Dietz - 8 percent is an expanded number. These could be fish that shed the CWT.
- John Arterburn - When do you release hatchery fish during harvest?
- Isaiah Martin – Hatchery fish are released when fish processing or transporting fails and fishing has already begun. Sockeye are released out of the bag without handling and we only remove broodstock.
- Casey Baldwin – Actual numbers for 2021 were less than the harvest target. If we are limited by equipment and need to manage pHOS, in a bigger year, it would be a bad thing if we were turning back hatchery fish because brood was consuming all of the staff and facility capacity. How much of the problem is staff and facility limitations to prevent harvest?
- Isaiah Martin - Most of the limitations are staffing and facility. This year it was processing. The fish are there to be captured and we have multiple channels to solve the issue in the future. Our locker inventory is from ladder surplus, which is easier than pulling them in from the boat.
- Brian Dietz - We get a lot of fish from surplus at Wells and Entiat later in the season. If we receive 300-400 fish from Wells, that fills the locker and causes a traffic jam. We need to look at actual surplus days and what is coming from Entiat or Wells. Then we can focus harvest on non-surplus days.
- Casey Baldwin - Other options are to share with other UCUT tribes. If the

limitation is in the boat and staffing, we can potentially get assistance from other UCUT tribes on certain days.

- Rich Bussanich - We would be interested in that option. Thanks.

10:50 – 11:05 ***Break***

11:05– 11:50 **Hatchery Production Program, Release Numbers and Broodstock Collection – Year-in-Review, 2021 Data and Analysis.** *Matt McDaniel, Casey Baldwin, CCT* (Packet Pages 60-81)

- *2021 hatchery release numbers and smolt survival*
- *2022 planned release numbers*
- *Source of broodstock (weir, purse seine, ladder)*
- *CWT and scale lab (age structure) results for broodstock based on collection location*
- *GSI Lab results BY16-BY19*
- *Management actions to meet program goals (pre-spawn mortality, fecundity)*
- *Spring Chinook – returns to ladder, broodstock source*
- *Forecast and likely broodstock management scenarios for 2022*

Questions/comments – Hatchery presentation

- John Arterburn – The survival to Rocky Reach for Summer Chinook subyearlings is only around 40 percent. Where are you losing fish?
- Casey Baldwin - No monitoring explains the loss. The planning assumptions for subyearlings are much less than yearlings. In the OKN population, subyearlings are the dominant life history. We have the pond space at Chief Joe and then move to Omak after yearlings are released.
- John Arterburn - Seems like very little likelihood of success after they pass through 7 more dams and pools.
- Casey Baldwin - Survival to McNary is in the 30 percent range, so there is much less loss after getting out of Rocky Reach.
- John Arterburn - Glad to see the precocity rate has decreased.
- Casey Baldwin - On the comparison of GSI vs visual, the modeled estimate came out higher than visual. Is the model still an estimate? What is the possibility of false positives?
- Andrea Pearl - Visual is the first observation during dissection of the gonads. Right now we are holding those fish for a month in a trough in the hatchery. The holding tanks/water could be a factor, but gives a better bimodal distribution and makes modeling easier. A good check/balance would be to implement other sampling techniques to make comparisons. KT sampling is an option.
- Casey Baldwin - Does anyone have an estimate of visual/GSI/KT? KT is expensive.
- Greg Mackey - We are doing GSI sampling for spring Chinook. Visual observation is more reliable than GSI mixture model. When distributions overlap, the mixture model doesn't detect fish that are immature vs mature as well as lab technicians. If distributions are separated, the mixture model works well.
- Casey Baldwin - I have a lot of confidence in the visual methods because it's very obvious when you open a precocious male.

11:50 – 12:20 ***Lunch***

12:20 – 2:00 **Research, Monitoring & Evaluation Program – Year-in-Review, 2021 Data Review & Analysis Summer/Fall Chinook.** *Andrea Pearl, CCT; Matt Laramie, USGS; Brian Dietz, CCT, Kirsten Brudevold, CCT* (Packet Pages 82-117)

- *Okanogan Juvenile Chinook Monitoring- Beach Seine (15 mins) (Packet Pages 82-91)*
- *Okanogan Adult Temporary Weir (10 min) (Packet Pages 92-101)*
- *Chinook Spawning Ground Summary (CWT and scale lab results, pre-spawn mortality) (35 min)*

(Packet Pages 102-117)

Questions/comments – Juvenile Monitoring presentation

- Todd Pearsons – I have concerns about data that we get from the RST results. Would we make changes to the program based on the data gathered from the RST? If we don't have good estimates for trap efficiency, we don't know what is passing the trap. Even for size or time of emigration, if we don't have a good efficiency we can't come up with an unbiased estimate of growth.
- Kirsten Brudevold - This continues to be a problem with the screw trap. The best thing about operating the trap is that we get to tag fish. The future of the trap is unclear.
- Andrea Pearl - Assessing juvenile outmigration is a standard problem. Operating a RST in the Okanogan is difficult due to high water temperatures, flows, debris, etc. We can't capture the entire run timing. It is currently our only tool to handle and capture fish for tagging. We are investigating off channel and side channel areas for other locations for capturing fish. We have a limited availability to access those channels based on flows and water temperatures. The data we get (size, condition, growth rate comparisons) we can't get a lot of other places. We didn't get any fish from Pharr Road last year, but we can in some years. Each year we assess the RST. The 5ft trap is the most useful. We have not investigated other areas in the Okanogan to see if the hydraulics allow us to operate other traps. We are also looking at other juvenile survival like egg to fry. OBMEP is looking at a pilot study to look at feasibility and water conditions and metrics in other areas in the Okanogan and Similkameen. It is currently the only option.
- Todd Pearsons - The Okanogan is a difficult working environment. If we continue to focus efforts for juveniles around RST then we aren't looking at other options that would be useful for making management decisions. What are other approaches? Genetic mark recapture? There are a number of techniques that may have more promise than the RST. There is opportunity cost – if you are using the RST, you don't have the ability to look at other techniques.
- Jeannette Finley - Why did numbers go down?
- Kirsten Brudevold - Our conclusion was the variable spill protocols at the lower river dams.
- Greg Mackey - RST challenges are not limited to the Okanogan and DCPUD is interested in working together on ideas.
- Catherine Willard – There are RST issues in the mainstem Wenatchee as well and we would like to participate in an "estimating juvenile productivity workshop" this spring.
- John Arterburn - I would like to engage in an "estimate juvenile productivity workshop".

Questions/comments – Temporary Weir presentation

- Dean Allan – Does the weir delay migration of sockeye? The picket spacing and holding downstream have been looked at. Have you looked to see if there are significant changes in sockeye over time in movement pattern or holding? Is there a consideration of removing pickets during a period where there is little movement?
- Andrea Pearl - We see the same movement in late morning and early evening. We haven't looked at PIT detections at OKL but we could. We have pulled pickets in past years.
- Casey Baldwin - The picket spacing allows sockeye to swim through but we don't observe them holding below the weir. The 2-inch spacing seems to allow unaltered passage. We looked at passage timing and have a Tech Memo from Jeff Fryer on acoustic tagging of sockeye. We didn't see any delay at that time.
- Tom Kahler - Dean and Richard - based on your dead pitch sampling, would a 2-inch spacing impose a size-selective passage condition on the sockeye? I'm anticipating that jacks could pass, but what about 2-ocean returns?
- Richard Bussanich – We are seeing a shift in size and age structure in both Osoyoos and Skaha sockeye, hatchery and naturals, but current Okanagan sockeye M&E haven't specifically analyzed

this.... as per selectivity of gear types or passage sites downstream of Osoyoos lake.

Questions/comments – Spawning Grounds presentation

- John Arterburn - Spatial plots give weight to the density dependence idea. I'd be interested in if reducing the number of fish released at that site could decrease the number of fish spawning in that area, but we'd still have to find a place to release those fish.
- Matt Laramie - The wild fish are content to go to the O6 area. Pulling the hatchery fish off would be a good test to see if wild fish would take over some of the better spawning habitat. An alternative approach would be to try to remove the hatchery fish, whether it's a ladder or seining off of the grounds.
- John Arterburn - Those fish are returning with a high degree of homing. Not releasing the fish there would be easier than removing returns. Would be interesting to test out removing some of the hatchery fish to see if wild fish move over.
- Casey Baldwin - If we reduce the density you might get the production of wild fish so more fish might return to S1. This does not necessarily mean they wouldn't spawn in O6, but that there might be more fish to colonize. There could be potential to put in a collection ladder and let the adults swim in. There is a transboundary effort to look at recovery efforts in the Canadian Okanogan. There are limitations to provide extra fish to that program, but we may be able to give them some of our releases. The original plan was to split summer Chinook into three ponds, but that wasn't possible. If we found another place to acclimate the spring Chinook, that could open up another site for Similkameen production.
- Matt Laramie - Is there anywhere in the lower basin that could allow for an acclimation site?
- Casey Baldwin - Not that I know of. We would have to develop a new acclimation facility somewhere.
- John Arterburn - Have you thought about switching Similkameen to spring Chinook?
- Casey Baldwin - Not recently. We want to rear in Okanogan water because there are more tributaries and into Canada. If they're in the Similkameen they're not in Okanogan water. Recoveries suggest Similkameen fish are recovered at a higher rate than Omak fish. Is it survival in the warmer Okanogan water, or are we more efficient at collecting Similkameen fish?
- Matt Laramie - We put in a bigger effort up north because we are striving for 20 percent recover rate.

2:00– 2:35 **Research, Monitoring & Evaluation Program – Year-in-Review, 2021 Data Review & Analysis Spring Chinook**. *Matt Laramie, USGS; Kirsten Brudevold, CCT* (Packet Pages 118-129)

- *Overview of SARs, PIT analysis*
- *Chinook Spawning Ground Summary*
- *Results of juvenile Spring Chinook monitoring*

Questions/comments – RM&E Program – Spring Chinook presentation

- Bill Gale – How are fish PIT tagged at PRD identified to the programs once they reach the Okanogan, is it via mark (ad clip vs ad present with CWT) or is it from genetic assessment (i.e. parentage)?
- Charlie Snow - Bill, I think that is my estimate, which used the fish mark and release proportions for releases of a similar mark.
- Bill Gale - Can we verify them with parental based tagging?
- Charlie Snow - Possibly if sampling was conducted at PRD. I'm not sure if any Okanogan 10j fish would type out separately from some of the other stocks.
- Bill Gale - As long as we noted the parentage at WNFH during spawning and they collected samples from the parents at CJH we should be able to differentiate them, assuming a fin clip was grabbed at PRD. There are lots of maybes, but it is something to think about.
- Charlie Snow - We had a much higher run in the Methow than we predicted based on the wild

run, so the 280 estimate for the Okanogan doesn't look that unusual. Some Okanogan fish in the run estimate actually go into the Methow to spawn and are not in the CWT record yet. This is probably a couple hundred fish. This estimate just means what we think would go to the Okanogan and could be refined post-season.

- Casey Baldwin – Are the 2,400 CJH segregated fish based on the lack of CWT when they were tagged at Priest so we assume they are CJH segregated?
- Charlie Snow - Yes, but there are lots of assumptions. We removed any fall back fish or double counted fish so we are left with anything that is above Wells escapement. Additional ad clip only fish get assigned to the Okanogan. There are other ways to apportion the numbers, but this seemed the most likely.
- Casey Baldwin - Glad this accounts for fall back.
- Charlie Snow - We used to use video and remove the last few weeks of fish. Now we do it with PITs. The number of wild fish seemed high, but made sense after the spawning ground survey.
- Casey Baldwin - It's not adding up with the number of PIT tagged juveniles if they really are CJH fish.
- Bill Gale - The proportion of segregated fish going into the Okanogan doesn't make sense. The number of PIT tagged juveniles were released and where they went. If a fin clip was collected at PRD when they PIT tag, we should be able to use PBT to identify the hatchery of origin. We should have a dataset to query these data against at PRD. It doesn't jibe with what I know about Leavenworth fish. We see very few fish going into the upper Wenatchee. I would be surprised if they are wandering that much. It could provide a good fact-check.
- Matt Laramie - Do we know if genetic samples were collected at Priest? No.
- John Arterburn – Why so many eDNA sites on Salmon Creek?
- Matt Laramie - When we started, we would sample at the confluence, then we are trying to get finer resolution in the streams. Salmon Creek has a lot of habitat and a long distance before the anadromous barrier. If we don't find redds, we are trying to see if there are redds in areas we can't survey.
- John Arterburn - If you have a fish above a point, you'd still detect it lower, can you detect where it is?
- Matt Laramie - In the dozen years since we started using eDNA, we haven't solidified how far upstream we can detect eDNA – gradient, flows, etc. all play a role. A collection of eDNA could be from 3 sites above, but you can determine the upstream extent of distribution.

2:35 – 2:40 Wrap-up, Actions *Andrea Pearl, CCT; MEI*

Questions/comments –

- Andrea Pearl - This discussion has been very helpful for management and your comments are being noted. We will be going over future program management tomorrow and in the afternoon we'll be going over our work plan. Thank you everyone for your participation.
- Casey Baldwin - Thank you, everyone. Thanks to all of the technicians and support staff that go into all of this work. Unfortunately we don't have more time face to face to discuss all of this. We'll have to address more of these questions throughout the year.

END DAY

12th Annual
Chief Joseph Hatchery Program Review (APR)
2022 Meeting Summary
DRAFT

Day 2 - Wednesday, March 30

Attendees: See attached attendance list

Part 5 – Future Program Management and Annual Work Plan for 2023/2024

9:00– 9:15 **Day 2 Objectives, Agenda Review, Actions to Complete.** *Casey Baldwin, Andrea Pearl, CCT; MEI*

9:15 – 10:35 **Future Program Management (2022 and Beyond).**

- *ISIT Updates – Key Assumptions, 2022 Management Targets*
- *Harvest and Hatchery programs (Jeannie Heltzel, MEI; Matt McDaniel, CCT, Isaiah Martin, CCT)*
- *RM&E program*

- Jeannie H. – Our data source for ocean harvest rates has changed, and assumptions for the past five years were adjusted to use the new data.
- Isaiah M. – Yes, data is now from NOAA. CRITFC data were derivations, and NOAA's numbers are actuals.
- Casey B. - I agree that is the best source for data. For Hatchery key assumptions, there might be minor management changes to try to increase survival. Total fecundity and functional fecundity are good to keep track of.
- Matt McD. - Until we can decrease broodstock prespawn mortality and egg survival, I don't think we need to adjust program goals. There is still room for improvement in other places to help us meet other parameters.
- Casey B. - What's our key assumption around the proportion of integrated brood in segregated program? Wasn't it 80-90%?
- Jeannie H. - Our assumption is 100%, but it's not realistic until we can figure out the origin of the fish. Maybe we should adjust to 85-90%.
- Casey B. - 2020 segregated brood was about 78% integrated, 15% segregated. Rates were better in 2021. If we dial back segregated brood, we need to acknowledge we may be including other program's fish. This is something we should keep track of in Hatchery Key Assumptions *(ACTION ITEM)*
- Todd Pearsons – There are published articles about Coast-wide shrinking of Chinook and fecundity. If you are willing to sacrifice some survival, you could produce fish that are smaller so they return at a later age. I don't know if that trade-off is worth it, but it's worth considering.

- Casey B. - We have looked at age at return for yearlings vs subyearlings. Our data on subyearling returns isn't good because we haven't gotten a lot of adults back. There have been reviews of size-selective spawning at the hatchery (large females vs large males). The conclusions from the article were to cross fish big vs. big and small vs. small, you get bigger fish that come back. If you intentionally high-grade when you collect, you get even bigger fish that come back. It's counter to hatchery management ideology, but considering what Matt showed in reduction in size through time, it may be a good idea to intentionally affect crosses.
- Todd Pearsons - I believe they were going to pilot at Wells.
- Casey B. - Add to work plan to look at size of crosses *(ACTION ITEM)*
- Todd Pearsons - It's actually mimicking the natural environment because large males have access to larger females.
- Isaiah M. - Anecdotally, I don't know any hatchery where staff weren't doing that, even when staff was told not to. Everyone is size selecting and using males many times.
- Richard B. - In our sockeye experiment, the brood takes in the first 10 years we didn't see a big shift, then the last 8+ years, we have seen a shift in age and size of fish. Bigs would be matched with bigs and a low portion of smalls with some random mixing. There has been a 5mm difference in both sexes for the Skaha. Look up the Ruth Wither paper on Chinook. *(ACTION ITEM: Rich B. to send paper to Casey B.)*
- Matt L. - I looked at length and fecundity regressions last year. Fish are definitely getting smaller in the Okanogan. There was a 13% loss in fecundity from 1993 to 2020 in Okanogan fish. Oke et al. found 16% reduction in Chinook size (in AK stocks) when comparing fish maturing <1990 to current. We see a 9% reduction in fish size just from 1993 to current, which represents a 15% reduction in fecundity.
- Casey B. – There are poor returns of PIT tags from the subyearling program, so it's hard to see age at return. We need to summarize data for CWT recoveries, currently we do this by recovery year not brood year. *(ACTION ITEM)* Look at size at release and how it affects size at return, and look at Hankin approach for size selective spawning.
- Casey B. - Does it make sense to have a stray rate target?
- Todd Pearsons - We do have a target because of implications of gene flow. We monitor brood year stray rate because there isn't a clear rationale around where you set what the target at. It's less consequential for you because it's such a low number.
- Casey B. - Change stray rate target to NA from Question mark. *(ACTION ITEM)* It's good to report and document, but not something to act on. Does it make sense to continue to pull out fish (i.e., donate to raptor center)?
- Andrea P. - This is identified in the work plan.
- Casey B. - We did find some steelhead, so we may need to add some parameters, like if we encounter X number of steelhead we will stop operating the ladder. As a reminder, we are expecting to have a similar year in 2022 as we did in 2021. Do we want to dial down pNOB in order to have more NOS? We can dial pNOB down to 30%. In bad years, we went down to 50-60%. This year we could go to 70-80% if we think it's worth it to have the number of NOS. If we collect 100 NOB, we might get 10 fish from out of basin and 10 from segregated program which has a higher number of out of basin fish, so only 70-80 of those fish would be the fish we want.

- Andrea P. - We have options to look at reducing pNOB and how it affects the objectives for PNI and pNOB in the ISIT. We're still above the PNI objective, but NOS escapement numbers are trending down, so we should consider it as an option.
- Casey B. - Projected 5 year average we are close to pHOS.
- Rich B. - Canada is interested in surplus fish for both food and for brood.
- Casey B. - BY18 was when the chiller broke and our smolt to smolt survival was low, so we should expect low SARs from those fish. A reason to keep the pNOB high is that as the HOR number goes up, you'll get a greater number of fish from other programs.

Questions/comments – follow up from Day 1

- Casey B. - We believe that sockeye are not impeded by 2 inch spacing. We have seen fish bigger than 2 inches fit through the 2 inch gap.
- Rich B. - Similar, the acoustic survey plus PIT data, so when you show individual PIT across multiple years. It's hard to attribute what we see on dead pitch to what we see downstream because we don't get a lot of recoveries. It would require a lot of effort that we don't have the budget for. You could always do a flume study test with excluder width. I don't think there were ever hydraulic simulations or testing, but based on what we are seeing basin-wide beyond the weir, we have raised interested questions about what is happening at Zosel. We aren't seeing the observations to support that. If it becomes an issue, you could look at more things and tag at Zosel.
- Casey B. - I've dismissed the issue, but we would not want to have a size selective bias for sockeye. If there is additional evaluation we can do that is low cost and reasonable effort, it should be considered to make sure it's not an issue.
- Andrea P. - There is interest in upper Columbia programs for a workshop to go over juvenile monitoring. We are definitely interested in a workshop. I don't know if there is a timeframe for establishing a workshop and setting up topics for discussion, but it should be put into the action plan. We will need to address that in the 2023 work plan. Coordination for that would need to happen in 2022. If that is an internal upper Columbia decision, great. There are some workshops for RST monitoring and Streamnet data collection. When it comes to actual juvenile productivity and how to measure that, I would be interested in other avenues outside of RST.
- Todd P. - What are you trying to achieve through juvenile monitoring? Is it a point estimate?
- Andrea P. – The goal when we started in 2013 was to attain productivity values for summer Chinook for the basin by operating through the season. We are using it for adult return rate as well, but juvenile productivity value hasn't been achieved because we haven't been able to conduct efficiency trials throughout the season and we aren't collecting enough fish.
- Matt L. - Is the number of smolts reflective of the number of spawners? Are there density dependent or environmental affects?
- Todd P. - That makes sense and is similar to Methow and Wenatchee. Challenges related to summer Chinook in that you get fry and smolts and you have to be able to compare across years. One of the challenges in the Okanogan is getting your hands on enough fish.
- Matt L. - Are there drawbacks to using total catch?
- Todd P. - If you make the assumption that your efficiency is the same every year, but that's not

true. Percentage of flow that you sieve, timing of flow, calendar year. We can't say the efficiency is the same in order to use raw counts. How representative is the catch of the fish migrating past the trap? Hard to say. Can you put together all of the data since you started collecting, and are you able to confidently look at numbers? Is it worth trying something new? It doesn't seem like there is a risk to not screw trapping.

- Matt L. - We get anywhere between a couple hundred and a million. Worth looking at if part of it is successful.
- Todd P. - We stopped using screw traps in the Hanford Reach of the Columbia because we couldn't get enough fish. It seems like you have a lot of fish at Gebbards landing.
- Catherine W. - Lower Wenatchee smolt trap has the same issue with very large confidence intervals. We PIT tag parr in the fall in the Tuala, then get outmigration estimates from those tags. They're putting a floating PIT tag barge in the lower Wenatchee this spring and another in the Methow. This may be able to estimate juvenile productivity as well. We also RST to get sockeye juveniles during a 2-week period. We'd like to get rid of lower Wenatchee smolt trap outside of the 2-week period. We won't have enough data from the PIT tag barge for a while to figure out if it's a valid assessment of juvenile productivity. Back calculation on red expansion.
- Andrea P. - Identify lead in the Action Plan for workshop between now and next fall. *(ACTION ITEM)*
- Matt L. - We started trying to do back calculations based on returns to figure out how many juveniles would be needed to create those returns.
- Andrea P. - We started looking at other techniques and led into the Egg to Fry study.
- Maureen - I can work with you to schedule that meeting. I know it's in the SOW.
- Isaiah M. - I have a meeting every year with Matt to discuss broodstock. Should we increase brood number?
- Matt McD. - We talked about late summer brood to put in raceways from spring Chinook (end of Aug/early Sept). We can look into further for this year. This is buffer for when they start dying later in the season.
- Isaiah M. - Have we ever discussed stream enhancement?
- Andrea P. - We discussed nutrient enhancement in the Okanogan and tribs, but we haven't done any of that work. There is a 30-day withdrawal period for hormone injection or formalin treatments for when carcasses can be distributed. I don't know if there is something else we can do other than the landfill.
- Isaiah M. - Is a work around to cull a few more when we remove fish from the ladder?
- Andrea P. - If the flesh is good, you take those. Later in the season when the flesh is bad, the question is what can we do with these fish.
- Casey B. - There is a whole process around carcass distribution. Pathogen monitoring, a plan for where and how much and where here, etc. That's beyond the scope of harvest or hatchery program or even the reintroduction program can deal with. It needs to come from a habitat enhancement program perspective if it should be implemented. Nutrient enhancement has never been identified as a limiting factor or a priority in the Okanogan. It needs a program to take it on, we can't squeeze it in to our existing programs.
- Matt L. - Have there been any broodstock collections from the Similkameen spawning

grounds?

- Abe - 2015 maybe for beach seining.
- Matt L. - A lot of our fish end up in that stretch. I don't know if seining is an option or if the stress would be too much. If there are late collection points, that would be a place to get the fish.
- Casey B. - The problem with collecting late fish at the ladder is that they would be mostly segregated fish. This would not help with the loss of the natural brood for integrated program. If we need integrated fish, beach seining is the way to go.

10:35 – 10:45 ***Break***

10:45 – 12:10 **Annual Work Plan for Anadromous Division to Support CJHP – Program Planning Exercise.** Activities, Responsible Parties, Timeline, and Deliverables. *Andrea Pearl, Casey Baldwin, Brian Dietz, Matt McDaniel, John Afterburn, CCT; MEI*

12:10 – 12:40 ***Lunch***

12:40 – 2:40 **Annual Work Plan for Anadromous Division to Support CJHP – Program Planning Exercise.** Activities, Responsible Parties, Timeline, and Deliverables. *Andrea Pearl, Casey Baldwin, Brian Dietz, Matt McDaniel, John Arterburn, CCT; MEI*

2:40- 2:45 **Wrap up, Actions and Next Steps.** *Casey Baldwin, Andrea Pearl, CCT; MEI*

END 2022 APR

Contact List: Colville Tribes / Chief Joseph Hatchery Program Annual Program Review

Updated: March 27, 2023

Contact Group	Name	Affiliation	Phone	Cell Phone	E-mail	Project Role
Bonneville Power Admin.	*Maureen Kavanagh*	BPA / Portland	(503) 230-4272		makavanagh@bpa.gov	COTR / BPA Project Manager
	Peter Lofy	BPA / Portland	(503) 230-4193		ptlofy@bpa.gov	Contract Approval Manager
	Ted Gresh	BPA / Portland			esgresh@bpa.gov	Contract Environmental Protection Specialist
	Brady Allen	BPA / Portland			mballen@bpa.gov	RME
	Andy Traylor	BPA / Portland	(503) 230-3268	(541) 905-6537	awtraylor@bpa.gov	COTR/ Hatchery O&M
	James Barron	BPA / Portland	503-230-4074	(971) 335-2663	jmbarron@bpa.gov	COTR/ Hatchery
CCT	*Joe Peone*	CCT	(509) 634-2113		joe.peone.fnw@colvilletribes.com	Director, Fish and Wildlife
	Jeannette Finley	CCT	(509) 634-2124		jeannette.finley@colvilletribes.com	Assistant Director, Fish and Wildlife
	John Arterburn	CCT	(509) 422-7424	(509) 631-2134	john.arterburn@colvilletribes.com	F&W Biologist
	Casey Baldwin	CCT	(509) 634-2110	(509) 427-1799	Casey.Baldwin@colvilletribes.com	Sr. Research Scientist
	Abraham Best III	CCT	(509) 634-1230	(509) 634-1230	abraham.best@colvilletrribes.com	Fisheries Tech. / Temp Harvest Manager
	Chuck Brushwood	CCT	(509) 422-7749	(509) 631-4605	charles.brushwood@colvilletribes.com	Policy Analyst
	Tony Cleveland	CCT		(509) 634-1248	anthony.cleveland@colvilletribes.com	Acclimation Pond Technician Lead
	Spencer Cleveland	CCT	(509) 634-6142		spencer.cleveland.fnw@colvilletribes.com	CJH Fish Culturist I
	Isaiah Martin	CCT		(509) 449-0845	isaiah.martin.fnw@colvilletribes.com	Harvest Program Manager
	Vertis Campbell	CCT		(509) 634-1201	vertis.campbell@colvilletribes.com	Fisheries Tech.
	Matt McDaniel	CCT	(509) 422-4590	(509) 631-1870	Matthew.McDaniel.fnw@colvilletribes.com	CJH Manager
	Jim Andrews	CCT		(509) 634-1232	james.andrews@colvilletribes.com	CJH Assistant Manager
	Makayla Andrews	CCT			Makayla.Andrews.fnw@colvilletribes.com	CJH Fish Culturist I
	Richardo Angel	CCT		(509) 634-1809	ricardo.angel.fnw@colvilletribes.com	CJH Fish Culturist Senior
	Leo Amundson	CCT		(509) 634-1202	Leo.Amundson.FNW@colvilletribes.com	CJH Fish Culturist II
	Virgil Michel	CCT		(509) 634-1809	Virgil.Michel.FNW@colvilletribes.com	CJH Fish Culturist II
	Chris Fisher	CCT	(509) 422-7427	(509) 631-0773	chris.fisher@colvilletribes.com	F&W Biologist
	Jesse Marchand	CCT		(509) 634-1092	jesse.marchand.fnw@colvilletribes.com	Fisheries Tech.
	Danny Tompkins	CCT		(509) 631-0535	danny.tompkins.FNW@colvilletribes.com	CCT Harvest Program Technician
	Andrea Pearl	CCT	(509) 422-7437	(509) 634-1364	andrea.pearl@colvilletribes.com	CJH M&E Program Manager
	Brian Dietz	CCT	(509) 422-7523	(509) 634-6177	brian.dietz.fnw@colvilletribes.com	F&W Biologist
	Kirsten Brudevold	CCT		(509) 631-6087	kirsten.brudevold@colvilletribes.com	F&W Biologist
	Kirk Truscott	CCT	(509) 664-1227	(509) 978-8031	kirk.truscott@colvilletribes.com	Anadromous Program Manager
	Therilyn Cheer	CCT	(509) 422-4580	(509) 634-1553	therilyn.williams.fnw@colvilletribes.com	Office Assistant CJHP
	Brian Miller	CCT	(509) 422-7739	(509) 322-3014	brian.miller@colvilletribes.com	F&W Biologist
	Cody Desautel	CCT	(509) 634-2249		cody.desautel@colvilletribes.com	Executive Director
	Jarred Erickson	CCT	(509) 634-2210	(509) 978-9260	jarred.erickson.cbc@colvilletribes.com	Chairman

Contact Group	Name	Affiliation	Phone	Cell Phone	E-mail	Project Role
	Michelle Campobasso	CCT	(509) 634-2106		michelle.campobasso@colvilletribes.com	F&W PR
CCT Consultants	***Dan Warren***	Meridian Environ	(206) 522-8282	(541) 602-5950	dwarren@meridianenv.com	Project Manager
	Robyn Rice	Meridian Environ	(206) 522-8282	(509) 531-2740	rrice@meridianenv.com	Fisheries Biologist
	Jeannie Heltzel	Meridian Environ	(206) 522-8282	(541) 272-1028	jheltzel@meridianenv.com	Biometrician
Public Utility Districts	***Tom Dresser***	GCPUD			tdresse@gcpud.org	Fisheries and Research Biologist
	David Duvall	GCPUD			dduvall@gcpud.org	Fisheries and Research Biologist
	Deanne Pavlik-Kunkel	GCPUD	(509) 754-5088	(509) 951-7343	dpavlikkunkel@gcpud.org	Hatchery and Habitat Fisheries Program Supervisor
	Betsey Bamberger	DCPUD			betsy.bamberger@dcpud.org	
	Tom Kahler	DCPUD	(509) 881-2322	(509) 679-1232	tomk@dcpud.org	Fisheries Biologist
	Andrew Gingerich	DCPUD			andrewg@dcpud.org	
	John Rohrback	DCPUD			john.rorhback@dcpud.org	
	Brad Hostetler	DCPUD	(509) 881-2963	(509) 540-7311	brad.hostetler@dcpud.org	Hatchery Manager, Wells Hatchery
	Catherine Willard	CPUD		(509) 699-8189	catherine.willard@chelanpud.org	Fisheries Biologist
	Scott Hopkins	CPUD	509-661-4763	509-630-2708	Scott.Hopkins@chelanpud.org	Fisheries Biologist
	Todd Pearsons	GCPUD	(509) 754-5088	(509) 859-2862	tpearso@gcpud.org	Fisheries Biologist
	Alene Underwood	CPUD	(509) 661-4364	(509) 881-5192	Alene.Underwood@chelanpud.org	Hatchery Program Manager
State/Federal/Tribal Agencies	***Jim Brown***	WDFW	(509) 754-4624		TeamEphrata@dfw.wa.gov	Region 2 Director, WDFW
	Dave Fast	YN	(509) 945-8460	(509) 945-8460	fast@yakama.com	Recovery Coordinator
	Bill Gale	USFWS	(360) 425-6072		william_gale@fws.gov	USFWS
	Justin Yeager	NOAA			justin.yeager@noaa.gov	Fisheries and Research Biologist
	Chad Jackson	WDFW			Chad.Jackson@dfw.wa.gov	Region 2 Fish Program Manager
	Ryan Fortier	WDFW	(509) 997-0048		Ryan.Fortier@dfw.wa.gov	F&W Biologist
	Charlie Snow	WDFW, Methow Research Team	(509) 997-0048		Charles.Snow@dfw.wa.gov	F&W Biologist
	Benjamin Goodman	WDFW, Methow Research Team			Benjamin.goodman@dfw.wa.gov	
	Patrick Hale	WDFW, Methow Research Team			Patrick.Hale@dfw.wa.gov	
	Chris Moran	WDFW, Methow Research Team	(509) 664-3148 x283		Chris.Moran@dfw.wa.gov	F&W Biologist
	Clint Deason	WDFW, Methow Research Team			Clint.Deason@dfw.wa.gov	F&W Biologist
	Heather Johnson	WDFW, Methow Research Team	(509) 664-3148 x 280		Heather.Johnson@dfw.wa.gov	
	David Pilliod	USGS			dpilliod@usgs.gov	Research Ecologist
	Andrew Murdoch	WDFW	(509) 664-3148		murdoarm@dfw.wa.gov	F&W Biologist
	Keely Murdoch	YN	(509) 548-2206 x101	(509) 670-7880	murk@yakamafish-nsn.gov	F&W Biologist
	Conor Giorgi	STOI	(509) 244-7031	(509) 998-1139	conor.giorgi@spokanetribe.com	Anadromous Program Manager
	Brent Nichols	STOI	(509) 626-4412	(509) 220-5377	bnichols@spokanetribe.com	Fisheries Program Manager
	Rebecca Cook	STOI			Rebecca.cook@spokanetribe.com	Fisheries Biologist Spokane Tribe
	Michael Humling	USFWS	(509) 996-2204		michael_humling@fws.gov	F&W Biologist, Mid Columbia Office
	Matt Cooper	USFWS	(509) 548-2992		matt-cooper@fws.gov	F&W Biologist, Mid Columbia Office
	Hayley Muir	USFWS	(509) 548-2998		hayley_muir@fws.gov>	F&W Biologist, Mid Columbia Office

Contact Group	Name	Affiliation	Phone	Cell Phone	E-mail	Project Role
	Greg Fraser	USFWS	(509) 548-2997		gregory_fraser@fws.gov	F&W Biologist, Mid Columbia Office
	Chris Pasley	USFWS	(509) 996-2424		chris_pasley@fws.gov	Hatchery Manager for WNFH
	Bob Gerwig	USFWS			Robert_Gerwig@fws.gov	Hatchery Assistant Manager/Biologist for WNFH
	Charles Frady	USFWS			charles_frady@fws.gov	Mid-Collumbia Office M&E Biologist
	Clifford (C.J.) Smith	USFWS			clifford_smith@fws.gov	Mid-Collumbia Office M&E Biologist
	David Clark	WDFW	(509) 661-8302	(509) 876-9262	David.Clark@dfw.wa.gov	East Bank Complex Manager
	David Cox	WDFW	(509) 682-5514		David.Cox@dfw.wa.gov	Similkameen Hatchery Manager
	Katy Shelby	WDFW			Katy.Shelby@dfw.wa.gov	Fish Program, Science Division, F & W Biologist 4
	Megan Finley	WDFW		(509) 607-6243	megan.finley@dfw.wa.gov	Aquatic Veterinarian
	Mike Tonseth	WDFW	(509) 663-9678		tonsemat@dfw.wa.gov	F&W Biologist
	Ryan Lothrop	WDFW			Ryan.Lothrop@dfw.wa.gov	WDFW, Columbia River Fishery Manager
	Mark Sorel	WDFW			Mark.Sorel@dfw.wa.gov	Cooperative F&W Research Units Prog., WA
	Charlene Hurst	WDFW		(360) 605-5247	Charlene.Hurst@dfw.wa.gov	Columbia River Management Unit Lead, DFW
	Tim Sippel	WDFW	(360) 902-2200		Timothy.Sippel@dfw.wa.gov	Salmon Fishery and Policy Analyst
Other Interested Parties	***Stacy Horton***	NPCC	(509) 623-4386		shorton@nwcouncil.org	NPCC State Staff
	Mark Fritsch	NPCC	(503) 222-5161		mfritsch@nwcouncil.org	NPCC Central Staff, Manager, Project Implementation
	Maureen Hess	NPCC	(503) 222-5161		MHess@NWCouncil.org	
	Tracy Bowerman	UCSRB	(509) 888-7219		tracy.bowerman@ucsrb.org	UCSRB Science Program Manager
	Nicole Jordan	UCSRB	(509) 662-4707	(360) 319-1365	nicole.jordan@ucsrb.org	Communications and Outreach Specialist
	Howie Wright	ONA	(250) 707-0095		hwright@syilx.org	ONA Fish Program Director
	Richard Bussanich	ONA	(250) 707-0095		Rbussanich@syilx.org	Fisheries Biologist
	Dan Stefanovic	ONA			dstefanovic@syilx.org	Hatchery Biologist
	Elinor McGrath	ONA			emcgrath@syilx.org	Fisheries Biologist
	Herb Alex	OIB			Herb Alex <halex@syilx.org	
	Kory Ryde	DFO			Kory.Ryde@dfo-mpo.gc	
	Dean Allan	DFO	(250) 851 4821		dean.allan@dfo-mpo.gc.ca	Resource Management - DFO
	Lauren Weir	DFO	250-299-7285		lauren.weir@dfo-mpo.gc.ca	DFO Chinook and Coho Analytical Program
	Lee Blankenship	NWMT / Retired HSRG	(360) 596-9400		lee.blankenship@nmt.us	NWMT
	Eric Kinne	WDFW / HSRG	(360) 902-2418		Eric.Kinne@dfw.wa.gov	WDFW

The Chief Joseph Hatchery
2023 Annual Program Review

Grant County PUBLIC UTILITY DISTRICT

BONNEVILLE POWER ADMINISTRATION

P.U.D. CHELAN COUNTY

DOUGLAS COUNTY PUD