The Chief Joseph Hatchery
2022 Annual Program Review

March 29-30, 2022

Virtual Meeting

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Part 1 – Program Overview

Colville Confederated Tribes
Chief Joseph Hatchery Program

March 29, 2022

Welcome to the Chief Joseph Hatchery's –12 th Annual Program Review (APR)

Please accept this invitation to join us at the 12th Annual Chief Joseph Hatchery Program Review. This year's meeting will be held virtually on March 29th and 30th. This workshop provides a unique opportunity for our staff to work with regional partners in support of the Colville Tribes' Anadromous Fish Division and its Hatchery Program. The technical and management expertise each of you brings to the APR is a key component for success.

The first day of this year's meeting is set aside to present results from 2021 activities and to discuss what we've learned. We will review our monitoring and evaluation designs, harvest regimes and our fish culture and production operations. We will also address the program's key management questions and provide information to facilitate the adaptive management process. Previous APRs have helped in this regard, and we expect this year to be no different. The rest of the agenda, on Day 2, is structured to examine the key analytical assumptions, biological targets and the decision rules which guide our hatchery, harvest and monitoring plans and activities for 2022. While these workshops typically are a Colville Tribes staff exercise, all invitees are welcome to attend beyond Day 1.

An informational packet is included with the Day 1 presentations in Part 3 as well as the 2022 hatchery production plan and notes from the 2021 APR meeting. Chief Joseph Hatchery was in its 9th year of operation last year and we were excited to see the fifth year of adult Chinook returns. 2021 was a good year for returns to the Upper Columbia and the program was able to achieve their hatchery and harvest goals for the season. We are encouraged that pre-season forecasts indicate similar conditions for fish returns to the Upper Columbia in 2022.

The Chief Joseph Hatchery Program's primary goal is to provide for long absent ceremonial and subsistence needs for our members, with secondary goals to also benefit other fishermen and wildlife from the ocean to the streams. Our objective is to do this through a conservation-based approach to increase the abundance, distribution and health of natural and hatchery-origin fish populations. Lastly, the CCT Fish and Wildlife program will continue to provide leadership for the recovery and protection of listed and non-listed fish, and their habitat, throughout the Columbia Basin.

On behalf of the Colville Confederated Tribes Fish and Wildlife Department, we appreciate your support and look forward to seeing you at this year's Annual Program Review.

Sincerely,

Joe Peone

Joe Peone, Director
Fish and Wildlife Department
Colville Confederated Tribes

The Chief Joseph Hatchery Program –Principles[1]

The Colville Tribes assert that hatchery production is an indispensable part of a multifaceted strategy to improve destabilized fish abundance and diminished system-wide survival. Unsustainable harvest regimes, migratory impediments, habitat degradation and other environmental factors have contributed to historic declines that require substantive action.

Put simply, we cannot replace lost habitat or overcome multiple human-caused limitations to sustainability, or maintain viable natural fish populations, unless hatchery programs are part of the overall approach. Therefore, individual program components must be viewed as tools that can be managed as a comprehensive policy to meet conservation and resource goals.

The actions being implemented by the Colville Tribes' Fish and Wildlife Department represent an extraordinary effort to recover Okanogan and Columbia River natural salmon and steelhead populations. The Tribes have embraced hatchery reform efforts that seek to find a balance between artificial and natural production and address the often conflicting goals of increased harvest and conservation.

Sound science and management principles and an adaptive framework are incorporated into the Chief Joseph Hatchery Program. This insures that production plans and activities are guided by science-based standards and that rigorous monitoring and evaluation designs are applied. These principles are:

1. *Manage hatchery broodstock to achieve proper genetic integration with, or segregation from, natural populations;*
2. *Promote local adaptation of natural and hatchery populations;*
3. *Minimize adverse ecological interactions between hatchery- and natural-origin fish;*
4. *Minimize effects of hatchery facilities on the ecosystem;*
5. *Maximize survival of hatchery fish in integrated and segregated programs;*
6. *Develop clear, specific, quantifiable harvest and conservation goals for natural and hatchery populations within an "All H" (Hatcheries, Habitat, Harvest, Hydro) context;*
7. *Design and operate hatchery programs in a scientifically defensible manner;*
8. *Monitor, evaluate and adaptively manage hatchery programs;*
9. *Institutionalize and apply a common implementation framework;*
10. *Use the framework to set priorities, guide project review, and determine return on investments;*
11. *Provide training for all program staff;*
12. *Host the Chief Joseph Annual Program Review as part of the adaptive management principle, and*
13. *Develop and maintain a state-of-the-art CJHP database and a highly functional web-presence.*

[1] Adapted from the Hatchery Reform Project, the CJHP 2012 Implementation Plan and other key program documents developed under the CJHP Master Plan (3-Step Process), Hatchery Science Review Group reports and independent science review.

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

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
Albeni Falls
Cabinet Gorge
Lake Pend Oreille
Noxon Rapids
Flathead Lake
Kerr
Thompson Falls
Grand Coulee
Long Lake
Nine Mile
Post Falls
Little Falls
Spokane
Upper Falls
Monroe Street
Wells
Chief Joseph
Chelan
Rocky Reach
Rock Island
Wenatchee
Keechelus
Kachess
Cle Elum
Bumping Lake
Tieton
Yakima
Priest Rapids
Wanapum
Lower Monumental
Little Goose
Lower Granite
Dworshak
Lewiston
Missoula
Pasco
Richland
Kennewick
Ice Harbor
McNary
Vancouver
Portland
Hillsboro
Beaverton
Gresham
Bonneville
The Dalles
John Day
Pelton Rereg
Pelton
Round Butte
Bend
Eugene
Springfield
Salem
Hells Canyon
Oxbow
Brownlee
Cascade
Deadwood
Owyhee
Boise
Nampa
Arrowrock
Lucky Peak
Anderson Ranch
American Falls
Pocatello
Idaho Falls
Palisades
Jackson Lake

Columbia River
Kootenay River
Pend Oreille River
Priest River
Kootenai River
Clark Fork
Flathead River
North Fork Flathead River
South Fork Flathead River
Hungry Horse Reservoir
Thompson River
North Fork Columbia River
Spokane River
Sanpoil River
Methow River
Chelan River
Lake Chelan
Banks Lake
Naches River
Riffe Lake
Cowlitz River
Lewis River
Yakima River
Deschutes River
Willamette River
Clackamas River
North Santiam River
South Santiam River
McKenzie River
Coeur d'Alene Lake
Clearwater River
North Fork Clearwater River
Grande Ronde River
Snake River
Powder River
Malheur River
Owyhee River
Boise River
Henry's Fork
Little Wood River

City
Modeled Dam
State/Province
Stream Centerline
CRT Region

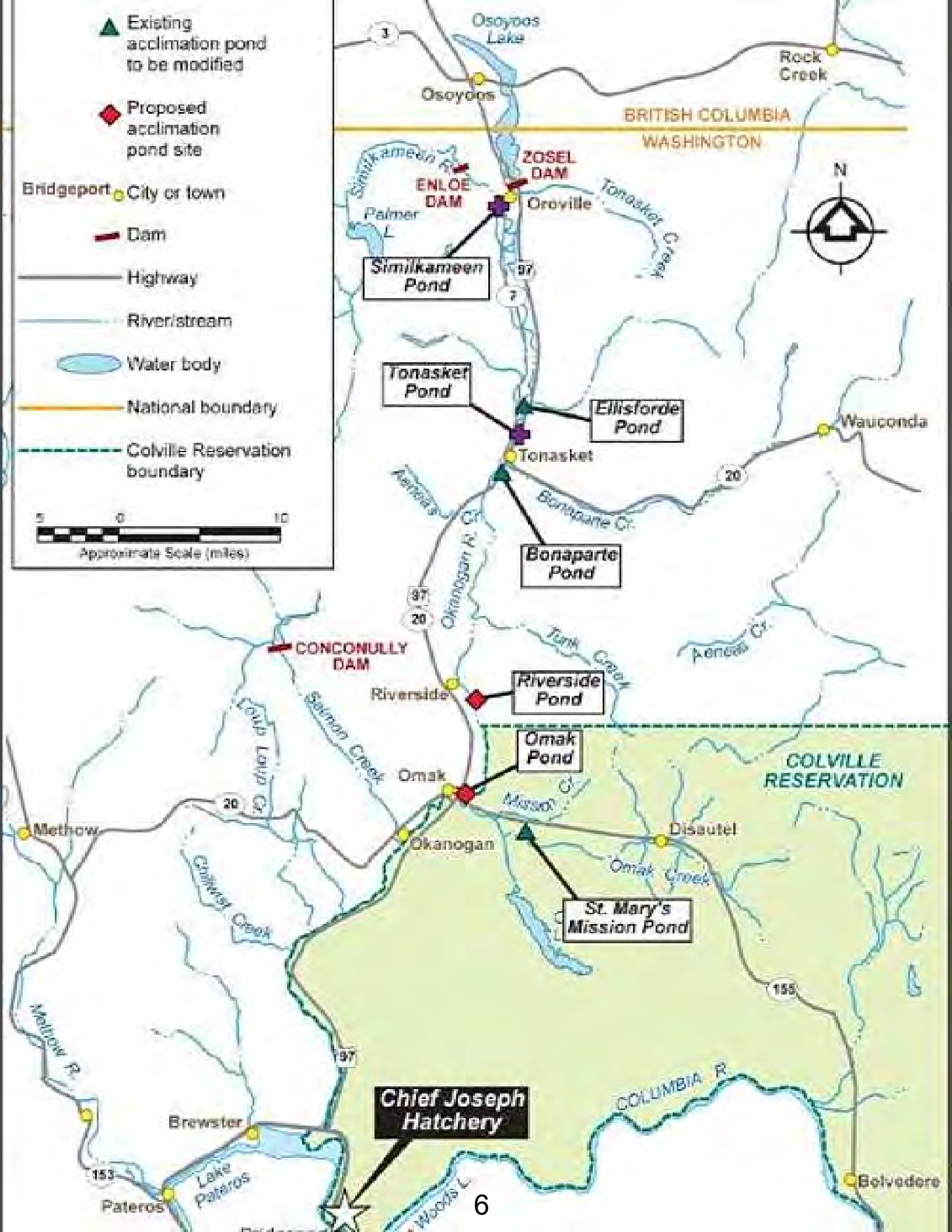
N

0 50 100 200
Miles

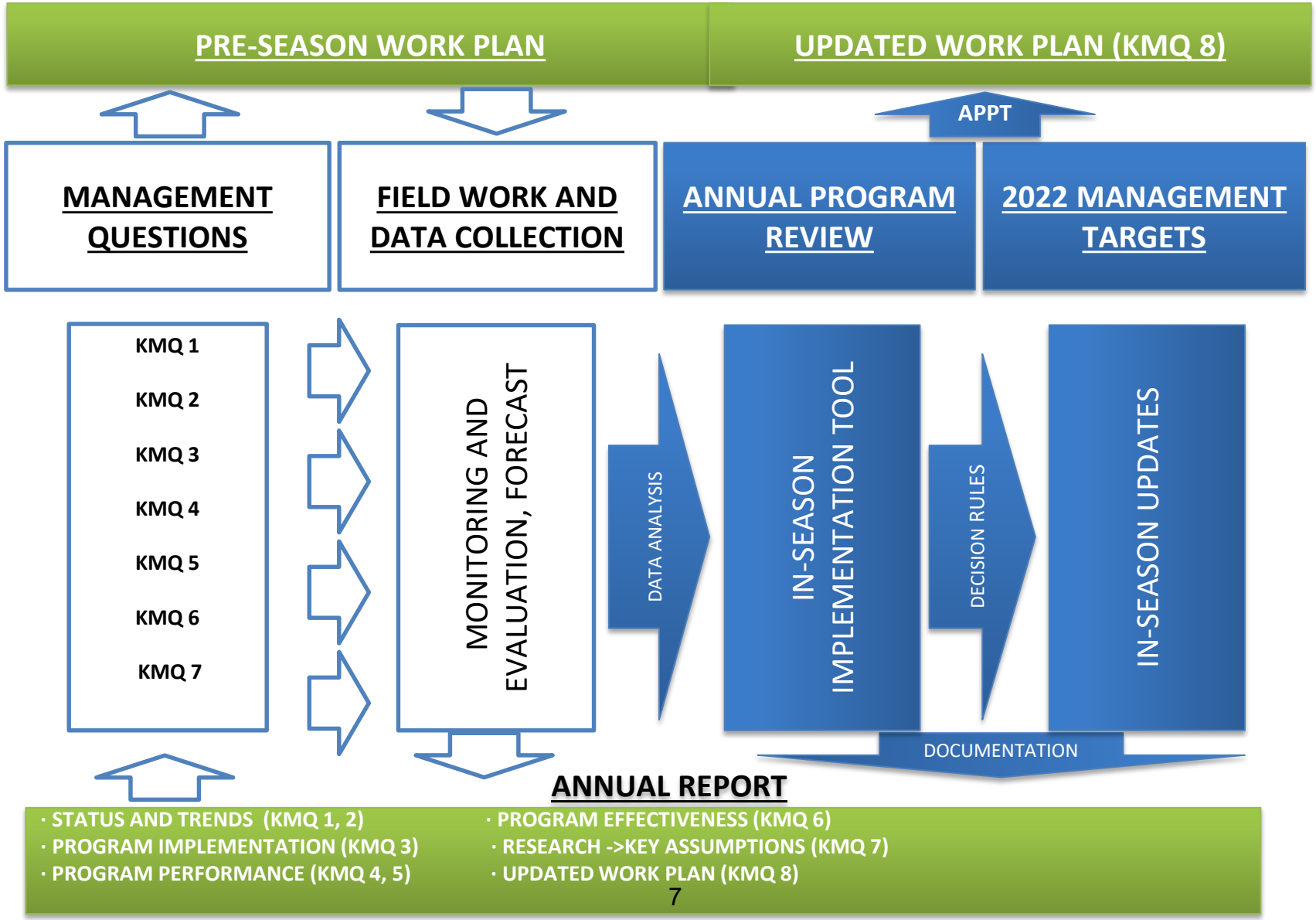
BONNEVILLE POWER ADMINISTRATION

US Army Corps of Engineers®

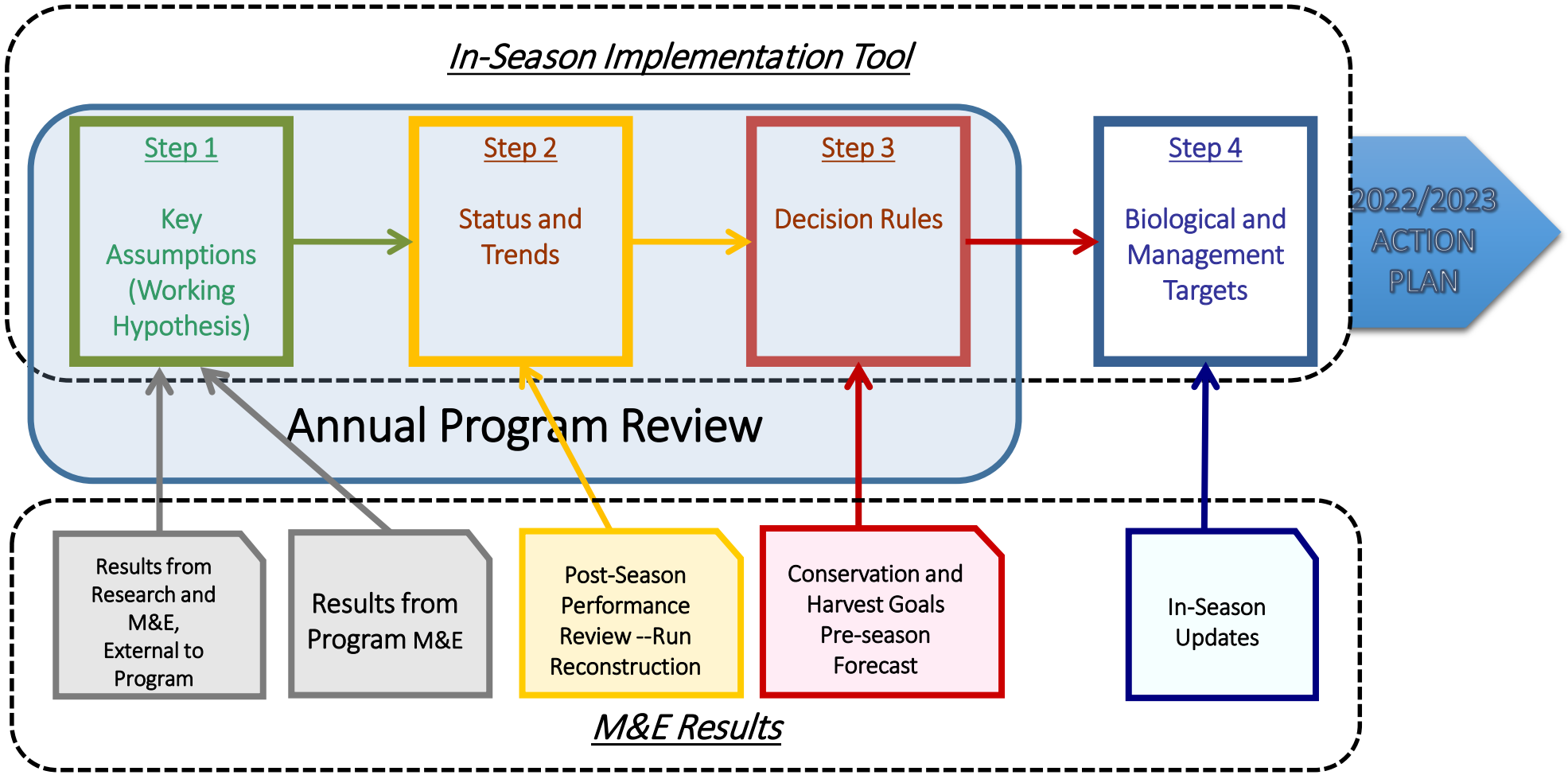
Map Created: 22 JUN 11


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
Turtle Creek
Aeneas Cr.
Loup Loup Cr.
Salmon Creek
Omak
Omak Pond
COLVILLE RESERVATION
Methow
Okanogan
Disautel
Omak Creek
Chiliwist Creek
St. Mary's Mission Pond
Methow R.
Brewster
Chief Joseph Hatchery
COLUMBIA R.
Lake Pateros
Pateros
Belvedere
Woods L.
97
20
153
155

Adaptive Management Implemented

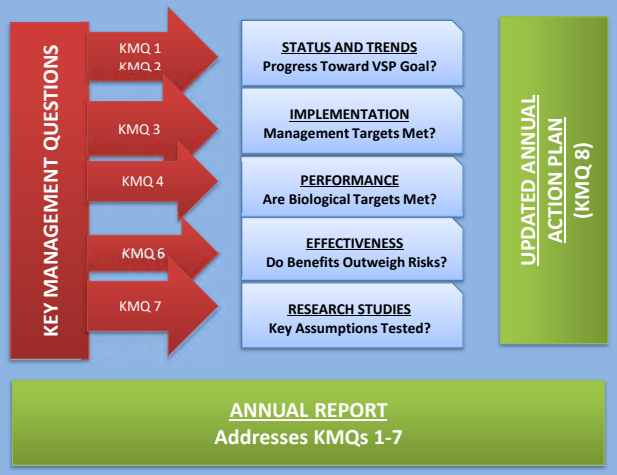


ISIT and the Annual Program Review



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: 2021 Year-in-Review

Population Status

Status and Trend of Okanogan summer/fall Chinook

Chief Joseph Hatchery
2022 Annual Program Review

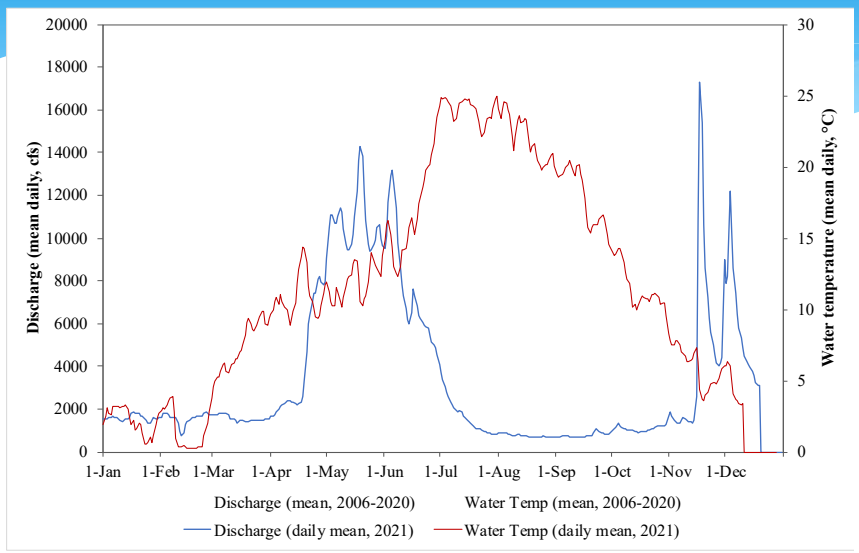
Andrea Pearl
Colville Confederated Tribes
Sr. Fisheries Biologist

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

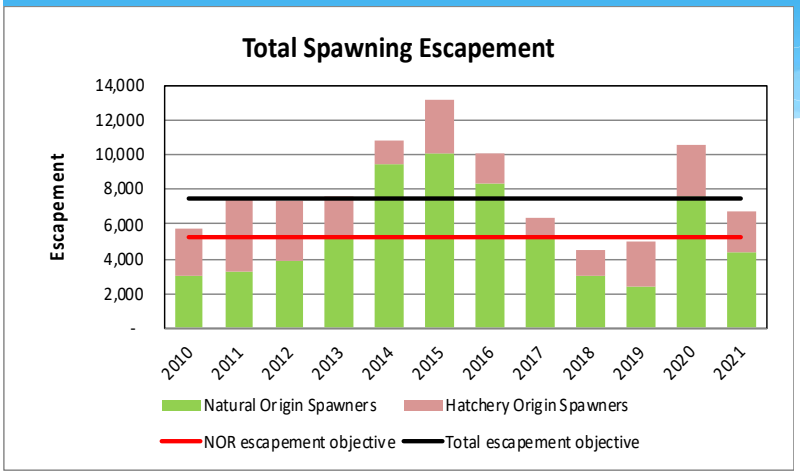
Viable Salmonid Population (VSP)

- 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



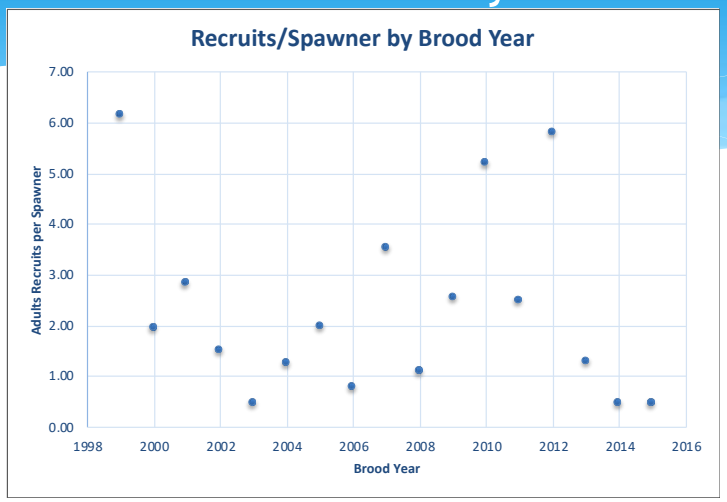
Abundance



5 yr mean
6,624

4,523

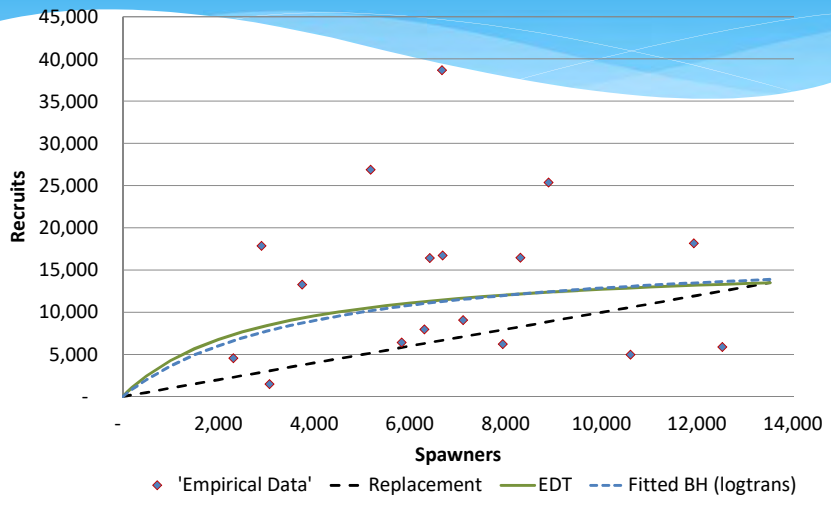
Productivity

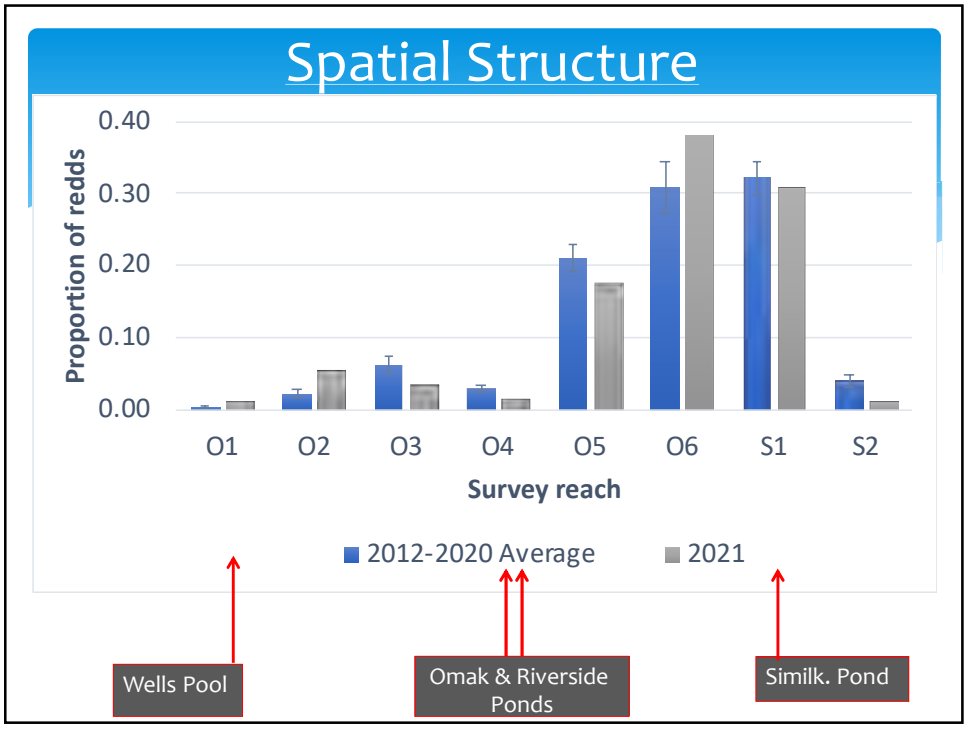


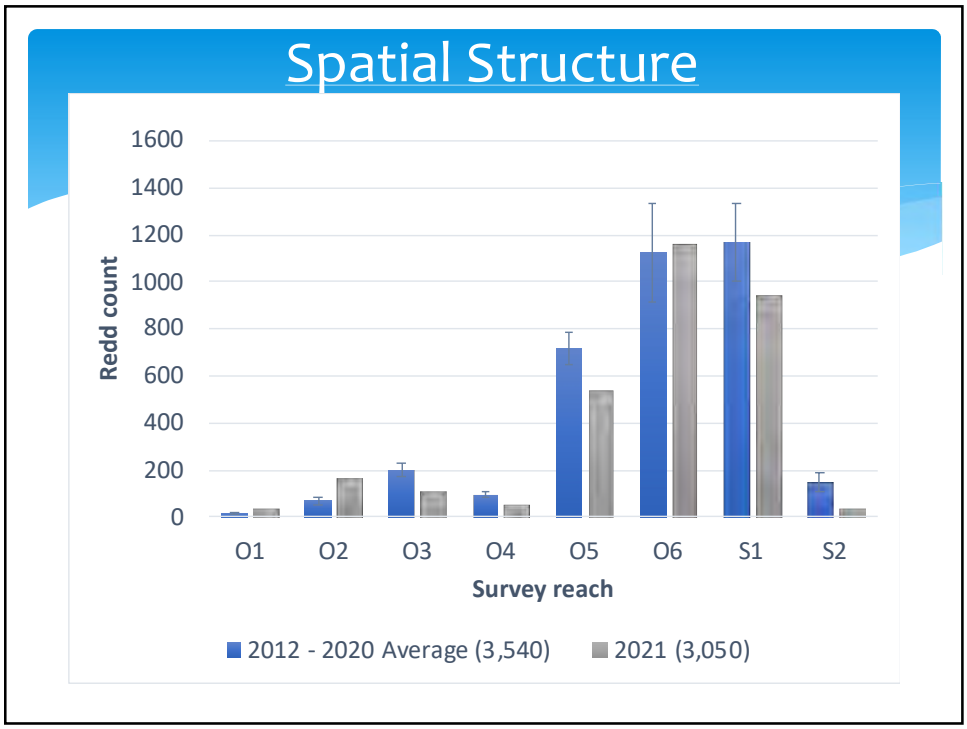
Overall Mean (1999-2015) = 2.4 R/S
10 Yr Mean (2006-2015) = 2.4 R/S
4 of 17 years < 1 R/S

Intrinsic Productivity

(Beverton-Holt modeled = 4.5) BY1999-2015




Spatial Structure
Proportion of redds
0.40
0.30
0.20
0.10
0.00
O1
O2
O3
O4
O5
O6
S1
S2
Survey reach
2012-2020 Average
2021
Wells Pool
Omak & Riverside Ponds
Similk. Pond


Spatial Structure
Redd count
1600
1400
1200
1000
800
600
400
200
0
O1
O2
O3
O4
O5
O6
S1
S2
Survey reach
2012 - 2020 Average (3,540)
2021 (3,050)

Diversity

1. **Genetic**
   - Structure of upper Columbia River summer Chinook and evaluate the effects of hatchery supplementation programs

* Objective
  - Determine if genetic diversity, population structure and effective population size have changed in natural spawning populations as a result of the conservation and hatchery programs
  - Hatchery and wild groups from upper Columbia basin
    - Okanogan, Methow, Chelan Falls, Entiat, Wenatchee and Hanford Reach
  - Make comparisons between pre-supplementation (1993) to post-supplementation (2008)

2021 Evaluation

* Assess the genetic effects of the hatchery program on natural populations
* BY17 and BY18 Analyses
  * natural- and hatchery-origin baseline samples (1982-1994)
  * natural- and hatchery-origin contemporary samples (2017-2018)
* Genotype samples from upper Columbia programs with appropriate SNP panel
  * Okanogan included 100 baseline samples (n=50 each from Similkameen and Okanogan) genotyped
  * Contemporary samples genotyped from CRITFC PBT analyses

2021 Results

- Measures of genetic diversity showed little differentiation among populations for summer Chinook
  - Hatchery programs not led to decrease in genetic diversity
  - F_{ST} was higher among baseline than contemporary collections
    - Suggests genetic drift and homogenization among stock has occurred over time
  - Pairwise comparisons of F_{ST} statistically non-significant both for baseline and contemporary collections
  - Similar to previous evaluations, appears to be little evidence for neutral genetic divergence between contemporary hatchery programs in the upper Columbia watershed and baseline samples collected in the late 1980's and early 1990's

2021 Results

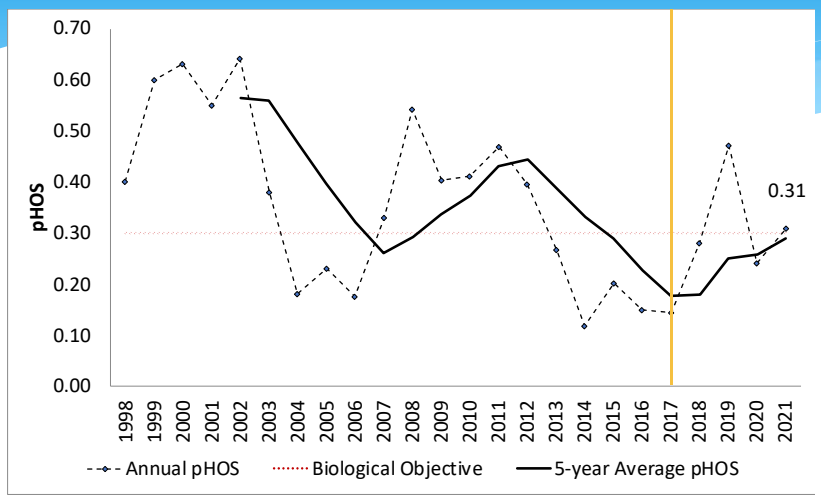
- Limitations
  - Not able to evaluate potential differentiation contemporary hatchery and natural origin individuals due to lack of data on individual origin
  - Not able to evaluate potential shifts in adaptive genetic diversity using genetic techniques
    - possible for adaptive genetic diversity (i.e., run–timing, age at maturity) to change in response to selection (i.e. domestication) while neutral genetic diversity remains the same
- Phenotypic metrics can serve as proxy for adaptive genetic variation

Diversity

2. **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

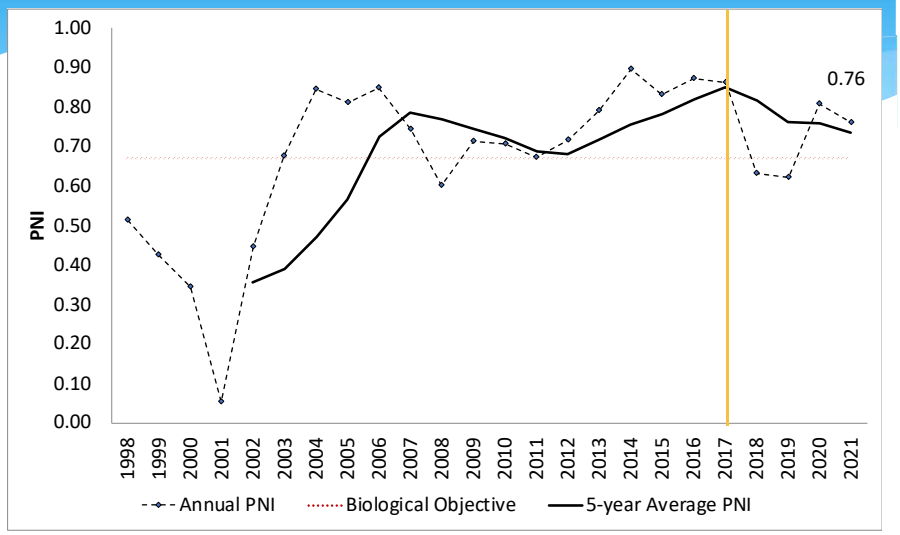
Diversity

3. **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 below the objective, but in 2021 the level was above the .30 objective (5-year avg. has gone up). PNI has gone down a bit but still above objective (5-year avg. starting to come down)

Conclusions

- Diversity: Results from the 2021 Upper Columbia region wide genetic evaluations showed that measures of genetic diversity had little differentiation among summer Chinook populations
  - Suggests that hatchery programs have not led to decrease in genetic diversity
  - Similar to previous evaluations
  - Management strategies in selective harvest and broodstock collection have contributed to this lack of neutral genetic change

Notes

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
- 2021 Outcomes and 2022 Forecasts

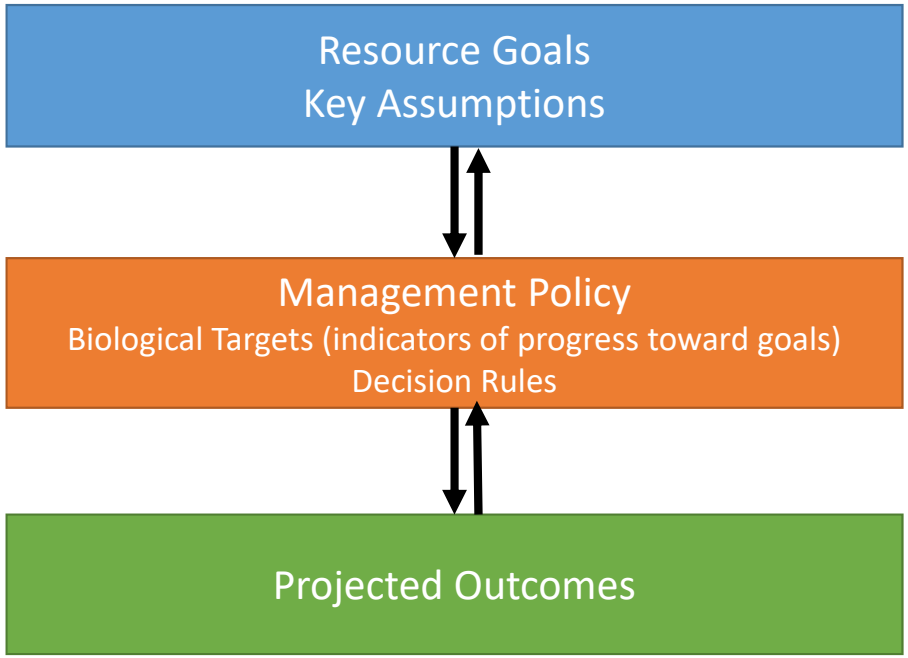
Components of Adaptive Management

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 (2022 pre-season ~ 3,100)
  - 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.

Key Assumptions - Harvest

HARVEST RATES-NORs	2018	2019	2020	2021	5-year average
Ocean (unmarked)	23.9%	22.2%	14.4%	18.9%	20.5%
Lower Col. Zones 1-5 (unmarked)	0.8%	0.4%	0.8%	0.8%	0.7%
Upper Col. Bonneville to Wells (unmarked)	26.8%	18.0%	14.7%	23.0%	21.7%
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%	20.5%
Lower Col. Zones 1-5 (marked)	4.4%	0.4%	2.9%	5.5%	2.8%
Upper Col. Bonneville to Wells (marked)	30.6%	30.8%	23.4%	37.4%	30.1%
Terminal Above Wells - Integrated	39.7%	35.7%	18.0%	-	29.2%
Terminal above Wells - Segregated	49.1%	58.6%	12.5%	-	21.6%

- 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 40% 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	77.1% (+)	77.1%
Eggs/Female - NORs	4,031 (-)	4,600
Egg to smolt survival-yearlings	77.7% (-)	86.0%
Egg to smolt survival-subyearlings	78.4% (-)	84.0%
Segregated Program In-Hatchery Assumptions	**5-year average**	**Planning Assumptions**
In-Hatchery Pre-spawning survival - HORs	77.6% (+)	77.6%
Eggs/Female - HORs	3,845 (-)	4,600
Egg to smolt survival-yearlings	82.1% (-)	86.0%
Egg to smolt survival-subyearlings	77.5% (-)	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))

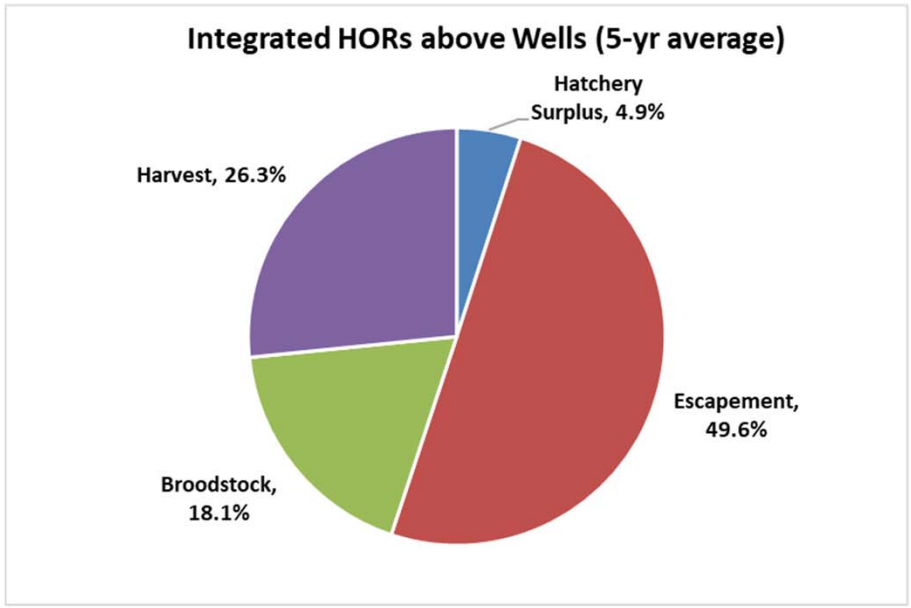
  3) Accept the lower biological targets and reduce the program goals for smolts released

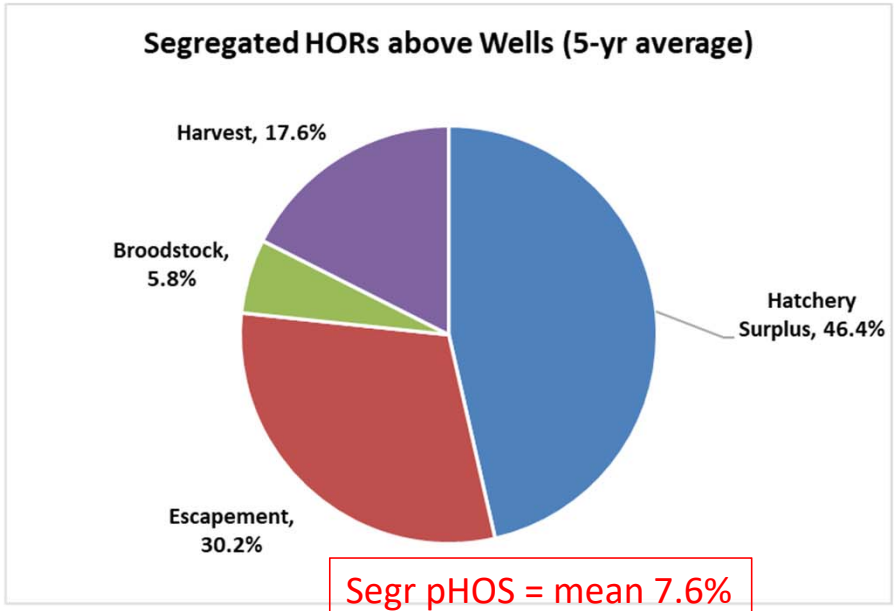
Key Assumptions - Hatchery

HATCHERY	5-year average	Planning Assumptions
SAR- integrated yearlings - BY	1.72%	0.90%
SAR- integrated subyearlings - BY	0.32%	0.27%
SAR- segregated yearlings - BY	0.95%	0.90%
SAR- segregated subyearlings - BY	0.07%	0.27%
Stray Rate from Integr. Prog (to other basins)	0.70%	??
Stray Rate from Segr. Prog (to other basins)	0.72%	??

- 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





Segr pHOS = mean 7.6%
max 17%

- ~5% of Integrated HORs returning to the CJ Hatchery helps the program meet pHOS target
- Segregated HOR escapement has been higher than expected (~30% of total returns to Wells); goal is for majority of seg HORs to be harvested or return to the hatchery ladder

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

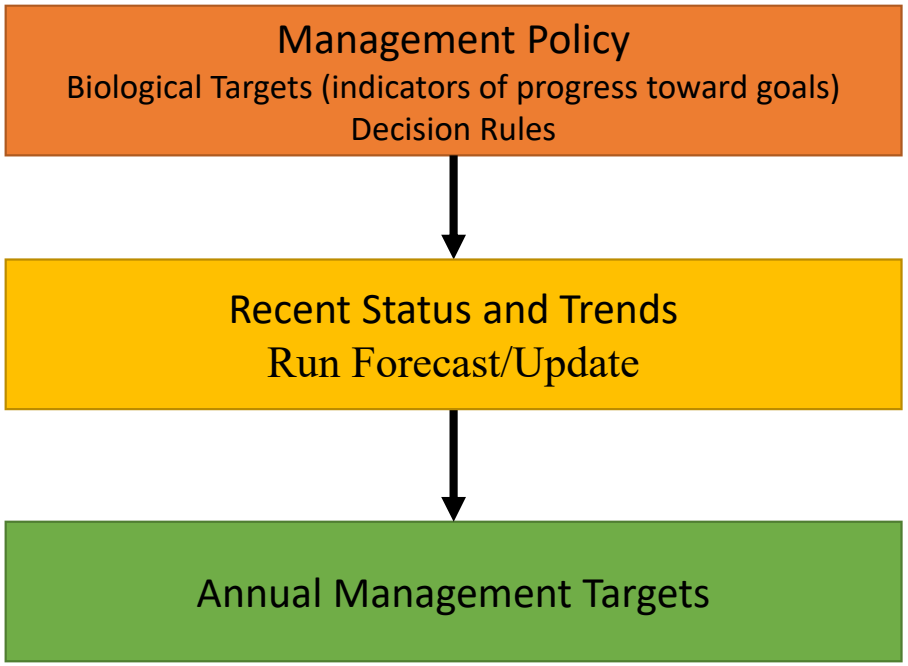
Components of Adaptive Management

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

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
2) 2022 pre-season TAC forecast is 57,500
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

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

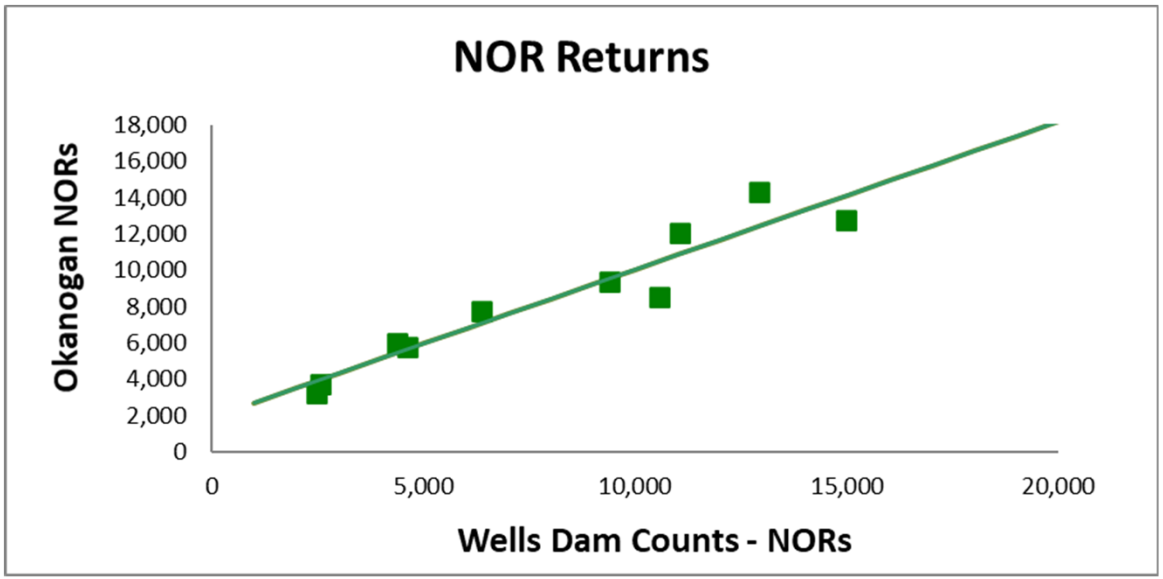
- In-season updates as PITs return to BON and Wells Dam

Wells Dam Run Forecast and Returns – 2021

2021 Forecasts and Returns	Preseason TAC Run Forecast (77,600 to BON)	Life Cycle Model Forecast	Inseason TAC Run Forecast (59,600 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	5,988	5,751	4,871	5,545	NA	NA	5,773
Okanogan HOR Forecast	3,496	4,602	2,844	2,952	3,434	2,448	3,509
CJH HOR Forecast	2,250	3,451	1,831	2,055	3,980	2,949	1,841
Total Return Forecast	11,734	13,804	9,546	10,552	7414 HORs	5397 HORs	11,123

- TAC and LCM pre-season NOR forecast was very similar to the in-season forecast based on July 15 Wells Dam counts; they all did a good job of predicting NORs.
- TAC pre-season forecast and 7/15 PIT tag forecast did a great job of predicting integrated HORs
- TAC pre-season forecast and 7/15 Wells counts did a pretty good job of predicting segregated HORs (having ~5 years of data on segreg. returns helps these forecasts); PIT forecast overestimated segreg. returns
- LCM overestimated HORs; uses actual releases and average SAR for past 5 years; also, we may not be accounting for all seg HORs (ladder closed/remain in the river)
- '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 – 2021

Actuals are based on final Wells Dam run sizes of:
5,773 NORs
3,509 Integrated HORs 1,841 Segregated HORs

Targets are based on final run forecasts of:
5,545 NORs
3,434 Integrated HORs 3,980 Segregated HORs

	Management Targets	2021 Performance Review Final Targets	2021 Actuals
Harvest*	Okan. HORs retained in Terminal Fisheries	1,232	850
	CJH HORs retained in Terminal Fisheries	964	472
	Incidental Loss of NORs	205	169
Hatchery and Weir*	Return of Okan. HORs to Hatchery	248	86
	Return of CJH HORs to Hatchery	2,412	923
	Okan. HORs retained at Weir	63	9
	CJH HORs retained at Weir	19	0
Integrated Hatchery Program	Natural Origin Brood (NOB)-Okan (collected)	702	705
	Hatch. Origin Brood (HOB)-Okan (collected)	-	-
	Projected Annual pNOB-Okan	100%	87%
		800,000 Yearl.	707,988 Yearl.
	Smolt Release-Okanogan	300,000 Subs	88,474 Subs
Segregated Hatchery Program	Hatch. Origin Brood (HOB) - Int	571	487
	Hatch. Origin Brood (HOB) - Seg (purse seine and ladder)	-	100
		500,000 Yearl.	568,675 Yearl.
	Smolt Release-CJH	400,000 Subs	177,932 Subs
Natural Spawning Escapement	Nat. Origin Spawners (NOS)	4,175	4,344
	Hat. Origin Spawners (HOS) - Int	1,187	1,870
	Hat. Origin Spawners (HOS) - Seg	525	312
	Hat. Origin Spawners (HOS) - out-of-basin	NA	184
	Total Number of Spawners (excludes jacks)	5,888	6,710
	Effective pHOS	25%	30%
	PNI	0.80	0.74

Wells Dam Run Forecast – 2022

2022 Forecasts	Preseason TAC Run Forecast (57,500 to BON)	Life Cycle Model Forecast
Okanogan NOR Forecast	5,205	5,827
Okanogan HOR Forecast	3,222	1,991
CJH HOR Forecast	1,913	1,576
Total Return Forecast	10,340	9,395

- 2022 Preseason TAC estimate for summer Chinook at Bonneville is 57,500 (last year's was 77,600)
- Life Cycle model estimates for 2022 are based on SAR of 2% (NOR) and 1.7% (HOR)
- 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 2022

Based on 2022 preseason TAC forecast, with adjustments to extend to Wells Dam:

5,205 Okanogan NORs
3,222 Integrated HORs
1,913 Segregated HORs

	Management Targets	2022 Targets
Harvest*	Okan. HORs retained in Terminal Fisheries	940
	CJH HORs retained in Terminal Fisheries	412
	Incidental Loss of NORs	178
Hatchery and Weir*	Return of Okan. HORs to Hatchery	227
	Return of CJH HORs to Hatchery	1,201
	Okan. HORs retained at Weir	63
	CJH HORs retained at Weir	9
Integrated Hatchery Program	Natural Origin Brood (NOB)-Okan (collected)	726
	Hatch. Origin Brood (HOB)-Okan (collected)	-
	Projected Annual pNOB-Okan	100%
	Smolt Release-Okanogan	800,000 Yearl. 300,000 Subs
Segregated Hatchery Program	Hatch. Origin Brood (HOB) - Int	592
	n Brood (HOB) - Seg (purse seine and ladder)	-
	Smolt Release-CJH	500,000 Yearl. 400,000 Subs
Natural Spawning Escapement	Nat. Origin Spawners (NOS)	3,872
	Hat. Origin Spawners (HOS) - Int	1,260
	Hat. Origin Spawners (HOS) - Seg	262
	Hat. Origin Spawners (HOS) - out-of-basin	NA
	Total Number of Spawners (excludes jacks)	5,393
	Effective pHOS	24%
	PNI	0.81

Expected outcomes if 2022 preseason run forecast is correct and management targets are met

STATUS OF BIOLOGICAL INDICATORS (5-year Running Averages)

	Program Biological Targets	Status in 2021 (5-year average)	Projected status in 2022 (based on pre-season TAC forecast)	Projected status in 2022 (5-year average)
NOS	5,250	4,523	3,872	4,250
pHOS	30%	27%	24%	29%
PNI	0.67	0.73	0.81	0.73

Conclusions

- **2021 returns were about average, in line with the preseason TAC forecast**
  - Harvest rates for HORs were above average, especially in Zone 6
  - Narrowly missed spawn escapement targets
  - Achieved PNI target
  - Achieved pHOS target
  - Made brood collection # for both integrated and segregated programs
  - ~90% smolt release target (integrated yearling program); >100% for segregated yearling program
  - ~30% smolt release target (integrated subyearling program); ~45% for segregated subyearling program
  - Ocean conditions very good for the 2021 outmigrating smolts (*2nd best since 1998 www.fisheries.noaa.gov/content/ocean-conditions-indicators-trends)*

- **2022 preseason TAC forecast is slightly below average and consistent with LCM for NORs**
  - 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 ~3,800 (below goal)

Notes

Part 4 – Data Analysis and Presentation: 2021 Year-in-Review

Hatchery Program Harvest Surplus

Hatchery Production, Release Numbers, Broodstock Collection

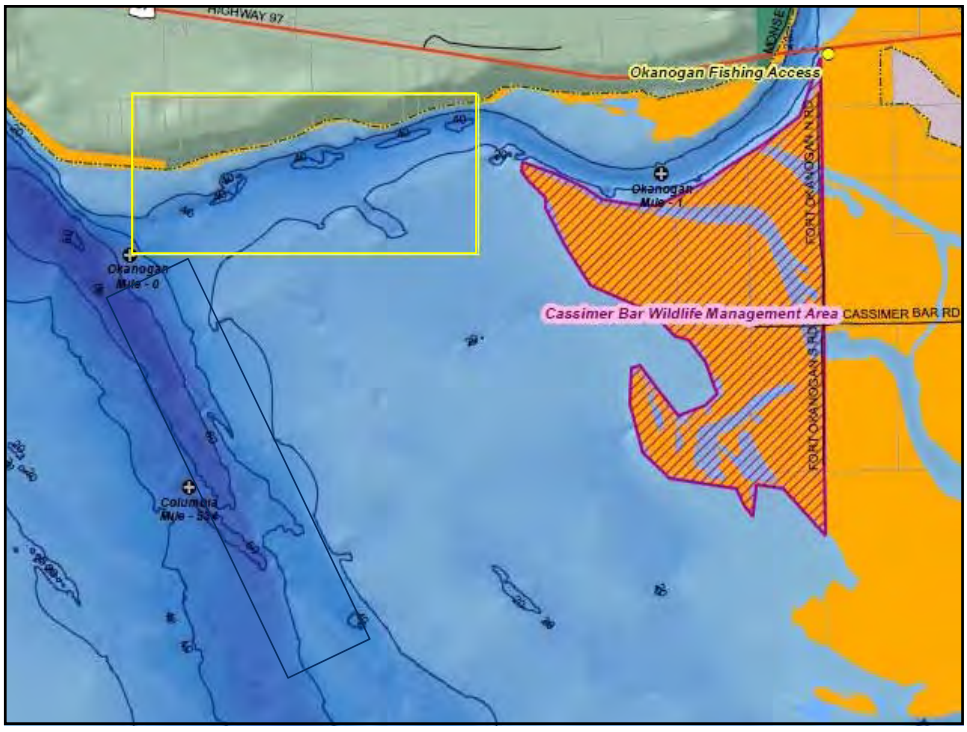
RM&E Summer/ Fall Chinook

RM&E Spring Chinook

2021 Harvest Review & 2022 Forecast

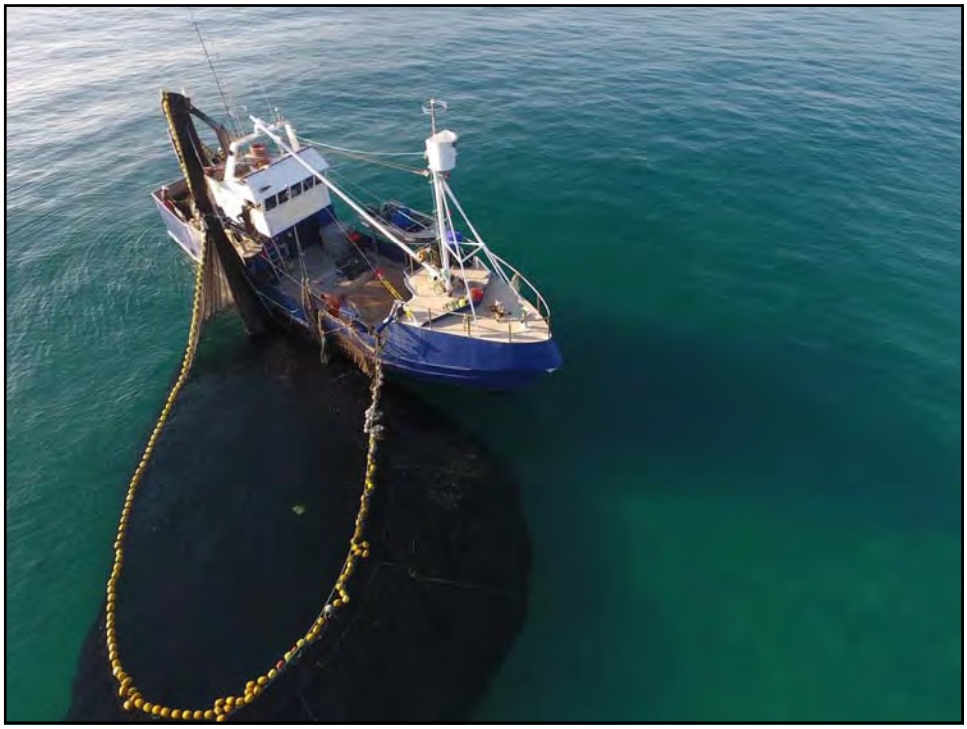
Isaiah Martin Harvest Manager
Brian Dietz Salmon Biologist

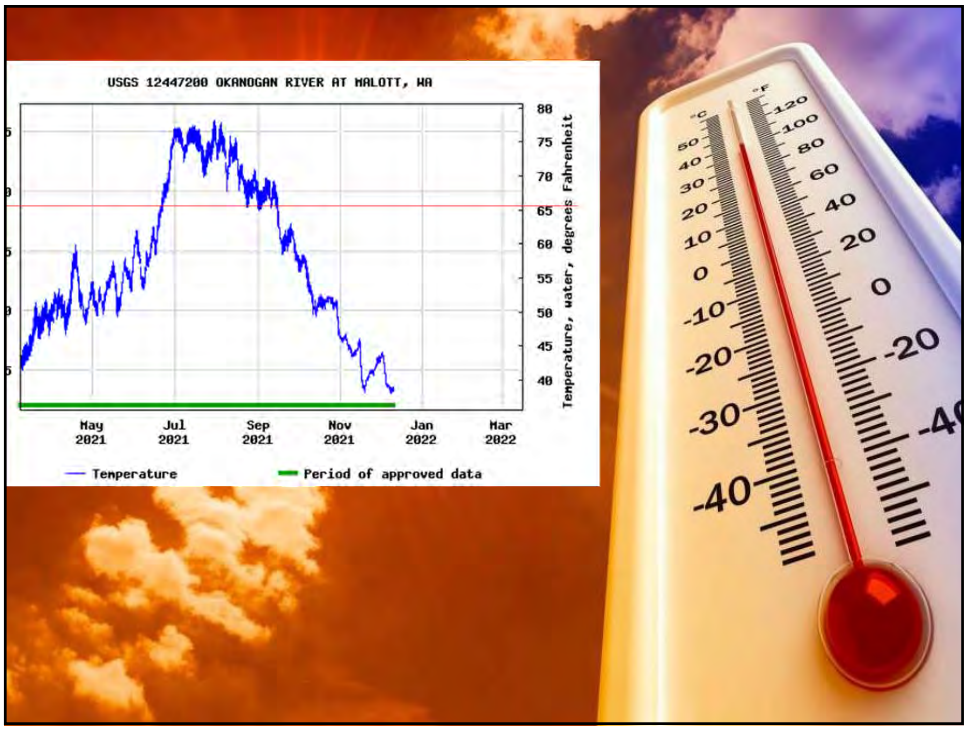
CCT Fish & Wildlife



Why Does it Work?

Osmoregulation




USGS 12447200 OKANOGAN RIVER AT MALOTT, WA
May 2021
Jul 2021
Sep 2021
Nov 2021
Jan 2022
Mar 2022
Temperature, water, degrees Fahrenheit
Temperature
Period of approved data
°C
°F

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*

2021 Upper Columbia Summer Chinook Allocations

(All data preliminary and includes kept + release mortalities)

	Pre		Post	
Runsize	78,810		56,800	
Harvest allocated	Allowed		Actual	Actual/
Fishery	Pre	Post	Take	Allowed
PFMC Ocean Fisheries	7,394	4,189	*4,189*	100%
Below Priest Rapids Dam (PRD)	*35.8%*	*23.6%*	*25.8%*	
Commercial below BON	1,193	492	7	1%
Recreational Below Bonneville	4,057	1,674	2,284	136%
Recreational BON to PRD	716	295	102	35%
Below PRD Total	5,966	2,462	2,393	97%
Above Priest Rapids Dam (PRD)	*64.2%*	*76.4%*	*74.2%*	
Wanapum Tribal	315	95	62	65%
Colville Tribal	5,894	3,985	1,583	40%
Recreational above PRD	4,507	3,890	5,246	135%
Above PRD Total	10,717	7,970	6,891	86%
Non-Treaty Total	**24,076**	**14,621**	**13,473**	**92.1%**

Collection Data

2021 Purse Seine fishing effort

HOR brood collected	587
NOR brood collected	665
NOR Chinook released	117
HOR Released	156
HOR Harvested	33
Sockeye harvested	1,745
Sockeye released	497

Activity	Summer/Fall Chinook										Sockeye	
	NOR Adult Broodfish	HOR Adult Broodfish	NOR Adults Released [1/]	NOR Adults Retained	NOR Jacks Released [1/]	NOR Jacks Retained/Morts	HOR Adults Retained/Morts	HOR Adults Released [1/]	HOR Jacks Retained	Total Adults Removed	Sockeye Harvested/Morts	Sockeye Released
CCT F&W Purse Seine	665	587	117	0	179	0	33	156	70	1,285	1,596	490
Tribal Member Alt Fishery [3/]	0	0	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	21	160	0	0	1,283	192	30	1,443	121	0
CCT F&W Okanogan Weir	10	0	27	0	5	0	9	0	5	9	22	7
Chief Joseph Hatchery Ladder Surplus	**0**	**0**	184	0	13	0	1,559	220	145	1,559	0	0
Harvest sub-total (includes post release mortality)	**0**	**0**	**13.9**	**160**	**0.0**	**0**	**1,316**	**99.8**	**0**	**1,589.4**	**1,740**	**0**
Sub-total Fish Released	**0**	**0**	**349**	**0**	**197**	**0**	**0**	**568**	**0**	**0**	**0**	**497**
Sub-total Handling and Release Mortality	**0**	**0**	**13.9**	**0**	**1.9**	**0**	**0**	**99.8**	**0**	**114**	**0**	**5**
Total Fish Removed	**675**	**587**	**13.9**	**160**	**1.9**	**0**	**2,884**	**99.8**	**250**	**4,419**	**1,740**	**5**
Grand Total of Adult Fish Removed	**Chinook Broodstock** → **1,262**				**Chinook Harvested** → **1,589.4**			**Chinook Surplus** → **1,568.0**			**Sockeye** → **1,745**	

Activity	Steelhead				Coho	
	Ad present Released [2/]	Ad absent Released	Ad Present Harvest	Ad Absent Harvest	Released	Harvested
CCT F&W Purse Seine	1	1	0	0	0	0
Tribal Member Alt Fishery [3/]	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	7.8	2.2	0	20
CCT F&W Okanogan Weir	6	4	0	0	8	0
Chief Joseph Hatchery Ladder Surplus	0	0	0	0	0	0
Harvest sub-total (includes post release mortality)	0.07	0.05	7.8	2.2	0	20
Sub-total Fish Released	7	5	0	0	8	0
Sub-total Handling and Release Mortality	0	0	0	0	0.1	0
Total Fish Removed	0.1	0.1	7.8	2.2	0	20
Grand Total of Adult Fish Removed	Steelhead → 10.1				Coho → 20.3	

	Spring Chinook													Sockeye	Steelhead					Coho
	HOR Adult Broodfish (CJH) [1]	Leavenworth NFH Brood [2]	NOR Adults Released	NOR Adults Harvested/Morts	NOR Jacks Released	NOR Jacks Harvested/Morts	10J Harvest	10J Adult Released	10J Jack Released	HOR Adults Harvested/Morts	HOR Adults Released	HOR Jacks Harvested	HOR Jacks Released	SubTotal Harvest -Chinook Adults Only	AD-Present	AD Present Harvested/Morts ***	AD Present Released [3]	AD Absent Harvested	AD Absent Released [3]	SubTotal Steelhead Harvested	SubTotal Coho Harvested
Chief Joseph Dam, Creel (May 27-June 30) Expanded with calculated release mortality . Includes 10J proportion	–	–	No CJH Spring Chinook Fishery in 2021											–	–	–	–	–	–	–	–
Chief Joseph Hatchery and Ladder Surplus	251	338	66	0	1	0	0	278	10	2	28	0	4	**0.0**	0	0	42.3	0	66.7	**0**	0
Icicle Creel [4]	0	0	0.0	16.0	0	4	0	0.0	0	197	0	13	0	**197.0**	0	0	0	0	0	**0**	0
Post Release Mortality	0	0	0.66	0	0.01	0.0	0	2.78	0.1	0	0.3	0	0.04	**3.7**	0	0	0.42	0	0.667	**1**	0
Sub Total of Adult Fish Handled	**251**	**338**	**66.7**	**16.0**	**1.0**	**4.0**	**0.0**	**280.8**	**10.1**	**199.0**	**28.3**	**13.0**	**0.0**	–	**0**	**0**	**42**		**66.7**	**1**	**0**
Grand Total of NOR Handling Mortality	**0**	**0**	0.7	0.00	0.0	0.00	0.00	0.00	0.10	0.00	0.28	0.00	0.04	–	**0.00**		**0.4**		**0.7**	**1.1**	**0.00**
Adult Harvest Total Counted Towards Allocation	**0**	**0**	**Spring Chinook Harvest** **0.0**											**Sockeye Harvested** **0**	**Steelhead Harvested** **1.1**					**Coho Harvest** **0**	
Spring Chinook Adults Removed from the System	**791.7**																				

2022 Forecast

Summer Fall Chinook Run: 57,500

PFMC Draft Allocation of ~ 3,100

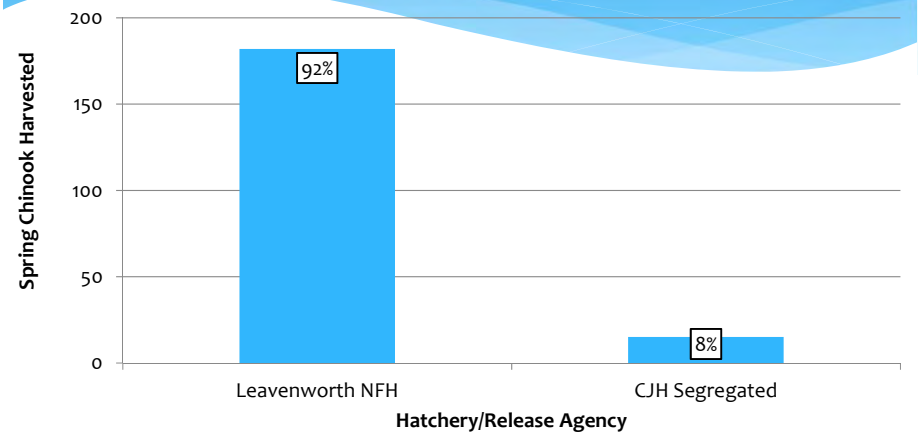
Okanogan Origin Sockeye Run: 175,700

Allocation = Excess of Escapement
Or
10% of Run

Icicle Spring Chinook Creel

by CWT Analysis

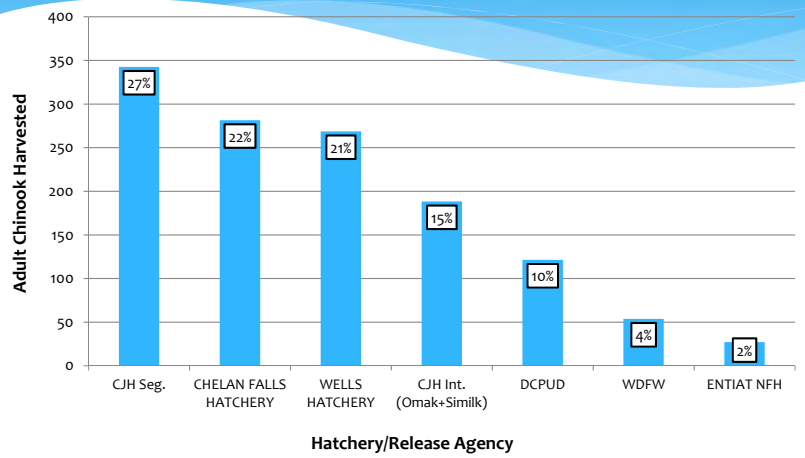
n=197



CJD Adult Summer Chinook Creel

by CWT Analysis

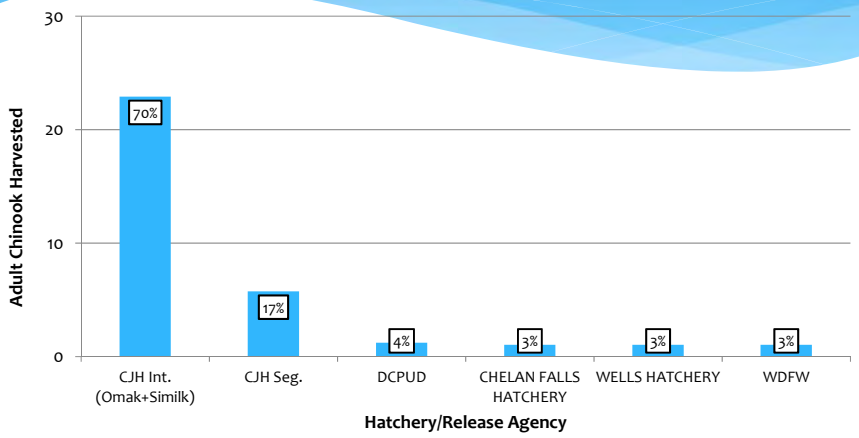
n=1283



Purse Seine Adult Summer Chinook Harvest

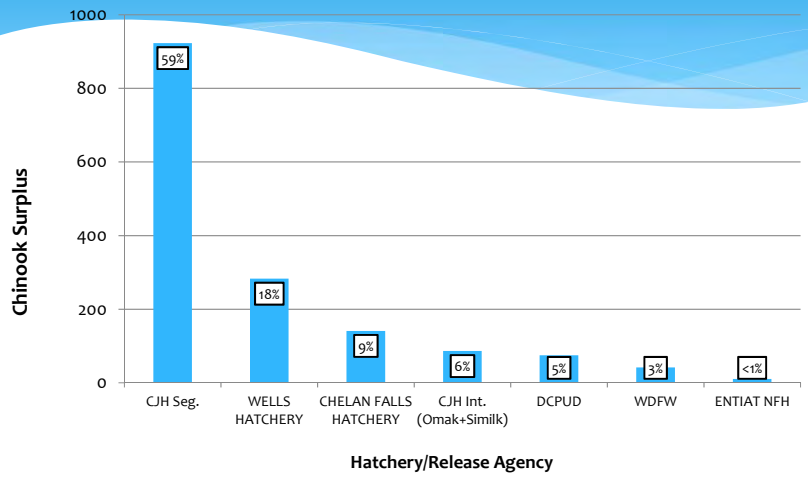
by CWT Analysis

n=33

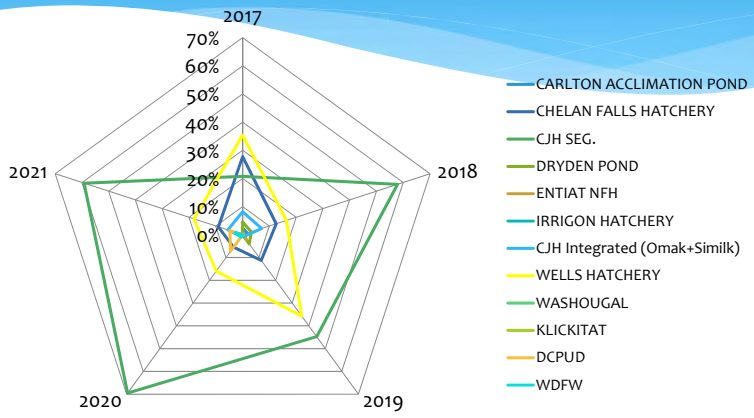


Summer Chinook Ladder Surplus

n=1559



5 Year Ladder Returns



Raptor Center Ladder Surplus

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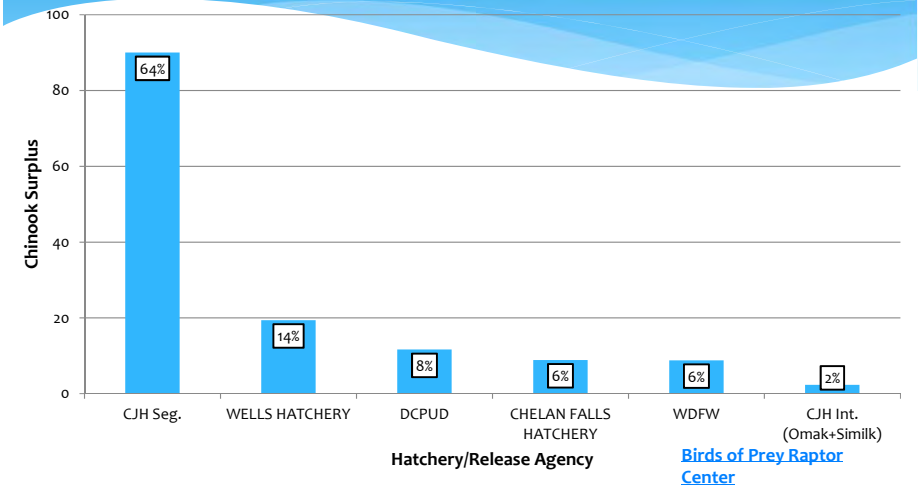


Birds of Prey Raptor Center

Questions?

Colville Confederated Tribes
Chief Joseph Hatchery
2022 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
2021 Release Summary

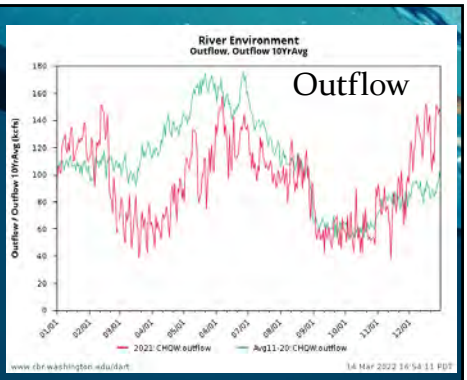
Summer Chinook – Okanogan Stock

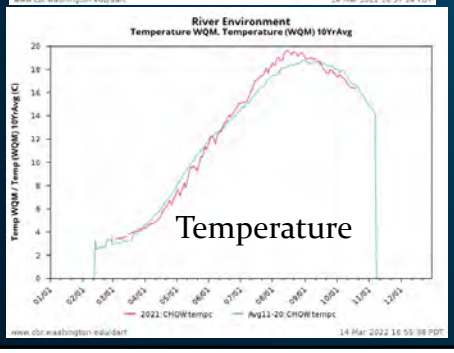
Life History	Brood Year	Release Date(s)	Site	Method	Size (fpp)	# Fish	Target
Integrated Yearling	2019	4/22/21	Omak AP (Okanogan R.)	Volitional	22.7	298,988	400,000
Integrated Yearling	2019	4/30/21	Similkameen AP	Volitional	17.0	409,348	400,000
Segregated Yearling	2019	4/20/21	CJH (Columbia R.)	Forced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

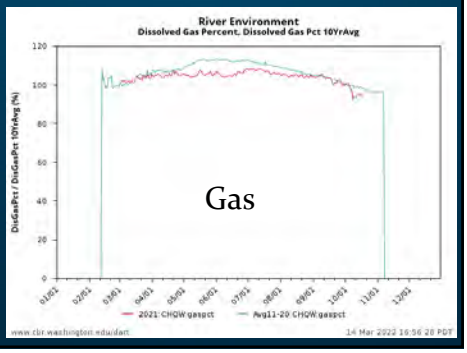
KQM 4: Are the hatchery post-release targets met for survival?

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

In-river conditions

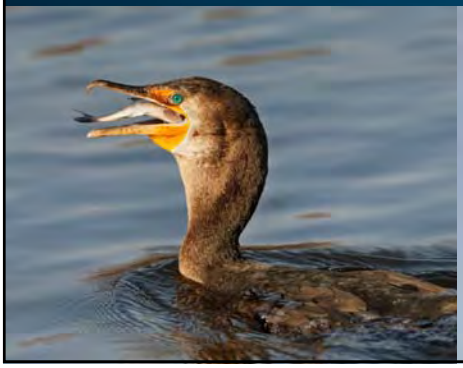




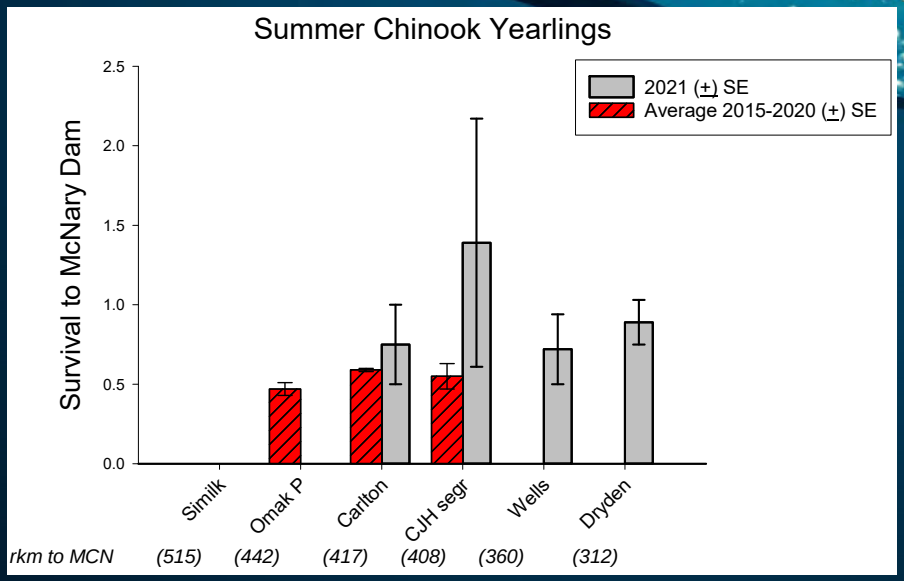


Management Practices

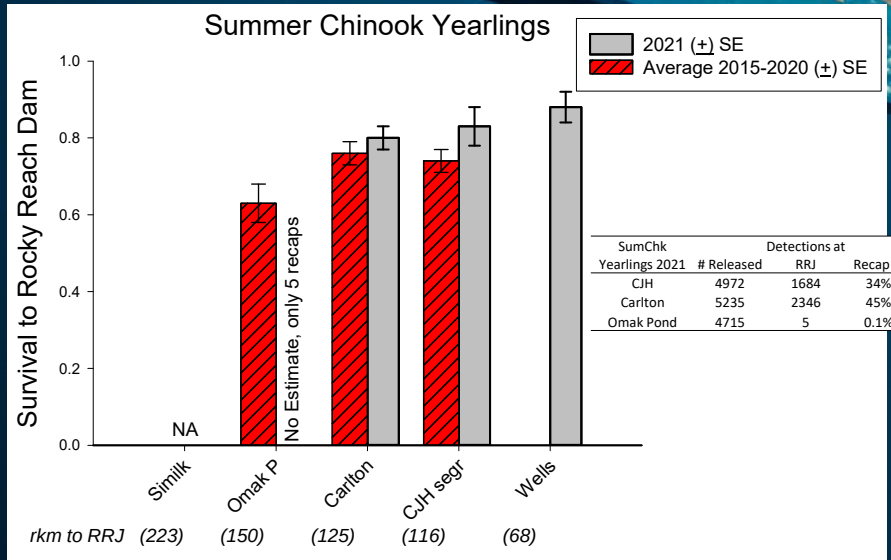
- 2021 night volitional release then 'force out' at CJH to reduce predation (SOP since 2016)
- Fish size and release timing:
  - SumChk Yearlings FPP=14.3 (target = 10)
  - Spr Chk Yearlings FPP=10 (target = 15)
  - SumChk Subs (Omak) FPP=47 (target = 50)
  - SumChk Subs (CJH) FPP=74.4 (target = 50)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



Survival to McNary Dam

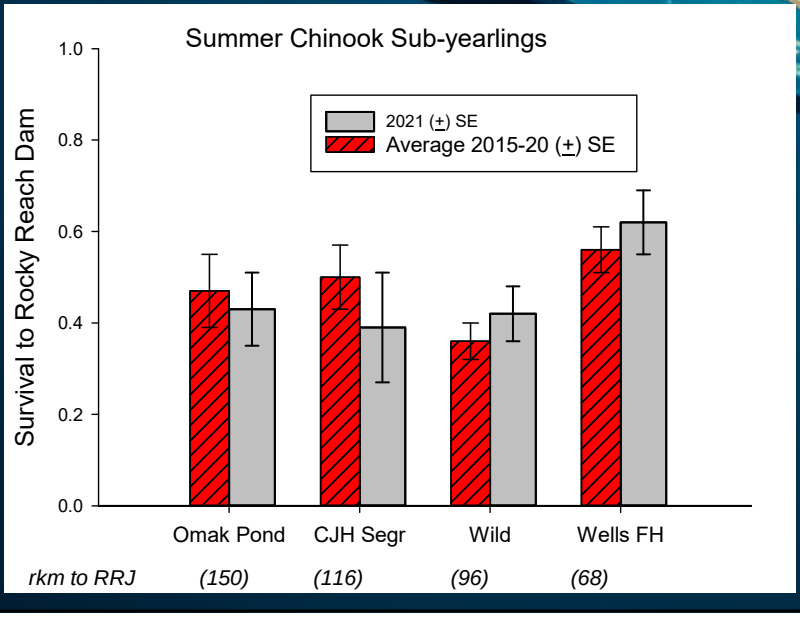


Survival to Rocky Reach Dam



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

Survival to Rocky Reach Dam



Summer Chinook In-river Survival Summary

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

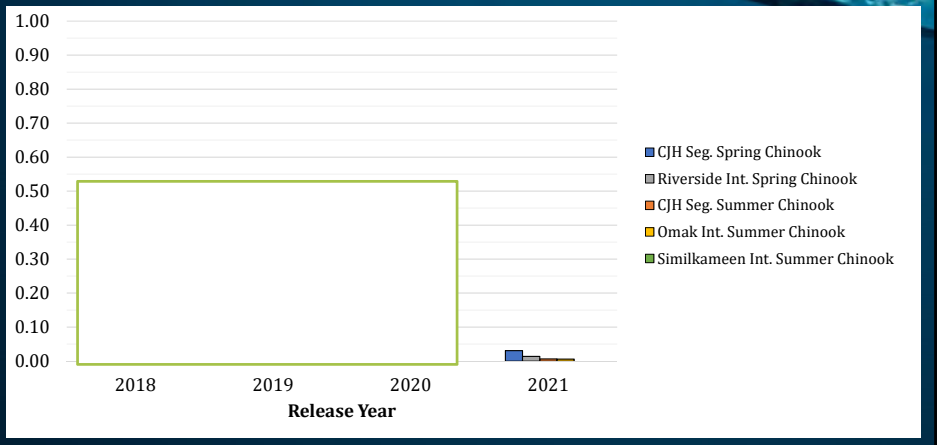
Gonadosomatic Index (GSI) Sampling

- Yearlings are held for a month after release, sampled in mid-May
- 300 fish from each release group sampled
- 5 total groups from integrated and segregated programs
- Measure weight and length of fish to determine the condition factor
- Identify males vs females based on presence of ovaries vs testes
- Dissect and remove gonads for all males and weigh on a micro scale to calculate the GSI Index
- Calculate the Log10 (GSI) and graph the frequencies in a histogram to see the bimodal pattern of immature and mature males
  - Determine the GSI threshold that separates immature and mature males
  - How many on each side of the threshold?

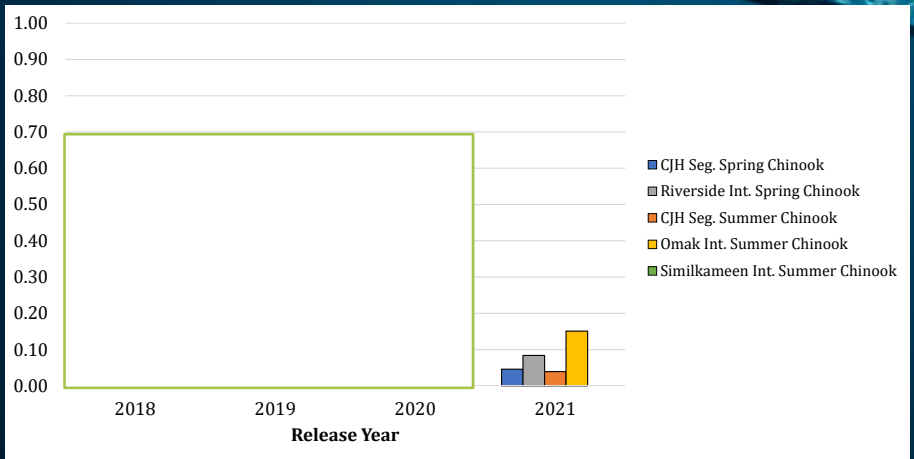
Summary of Results

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

Precocity Rates (Visual)



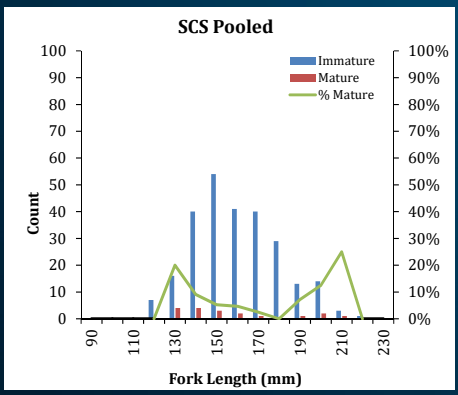
Precocity Rates (Modeled)

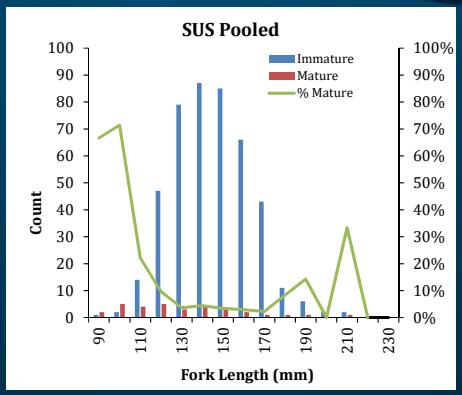


Summary of Results

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

Are male forklengths at release related to early maturation?





Other questions?

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

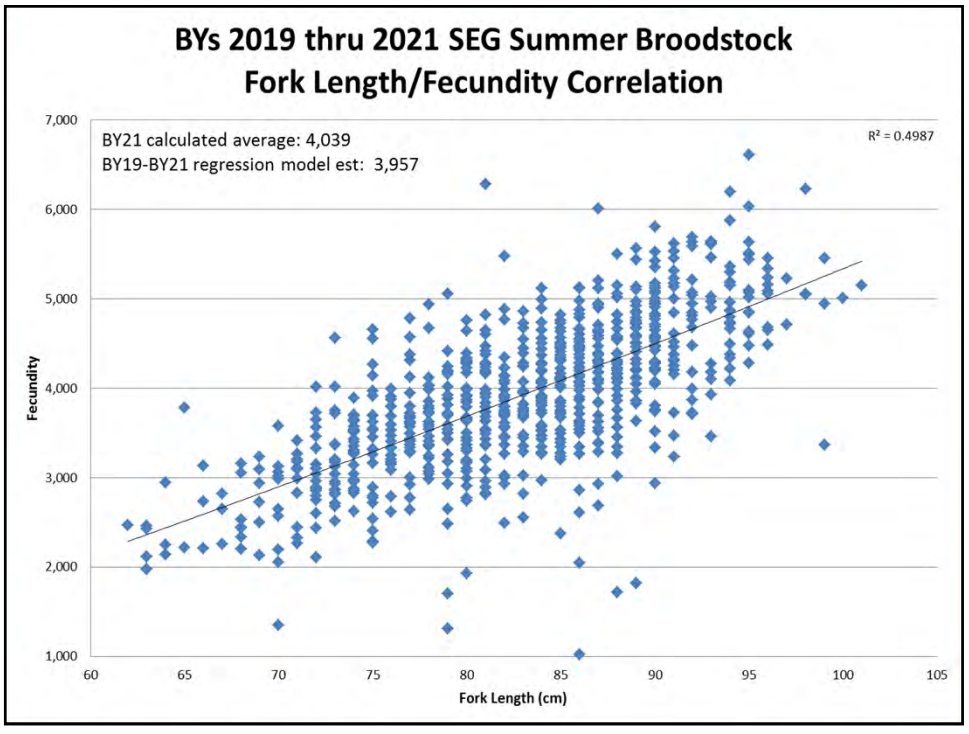
BY21 Summer Chinook Broodstock Survival to Spawn

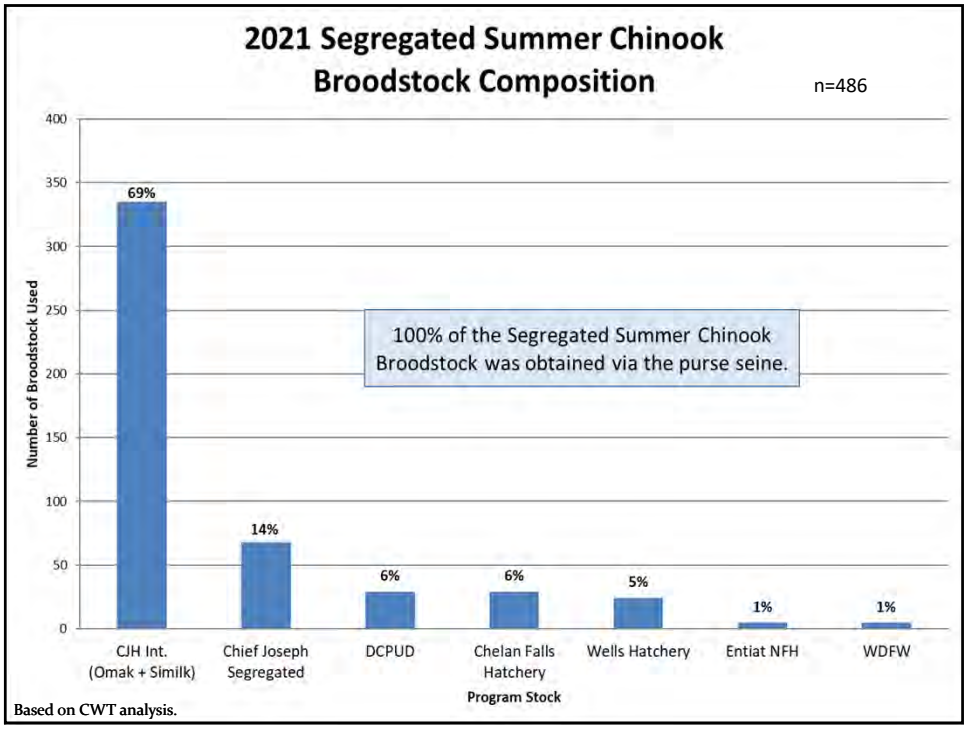
Integrated (NOR)			
	# Fish Spawned	# Brood Collected	% Survival to Spawn
Females	234	330	66.8%
Males / Jacks	205 / 0	350 / 4	80.5%
Total	**439**	**699**	**74.0%**
Segregated (HOR)			
	# Fish Spawned	# Brood Collected	% Survival to Spawn
Females	267	356	75.0%
Males / Jacks	217 / 2	320 / 11	70.7%
Total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

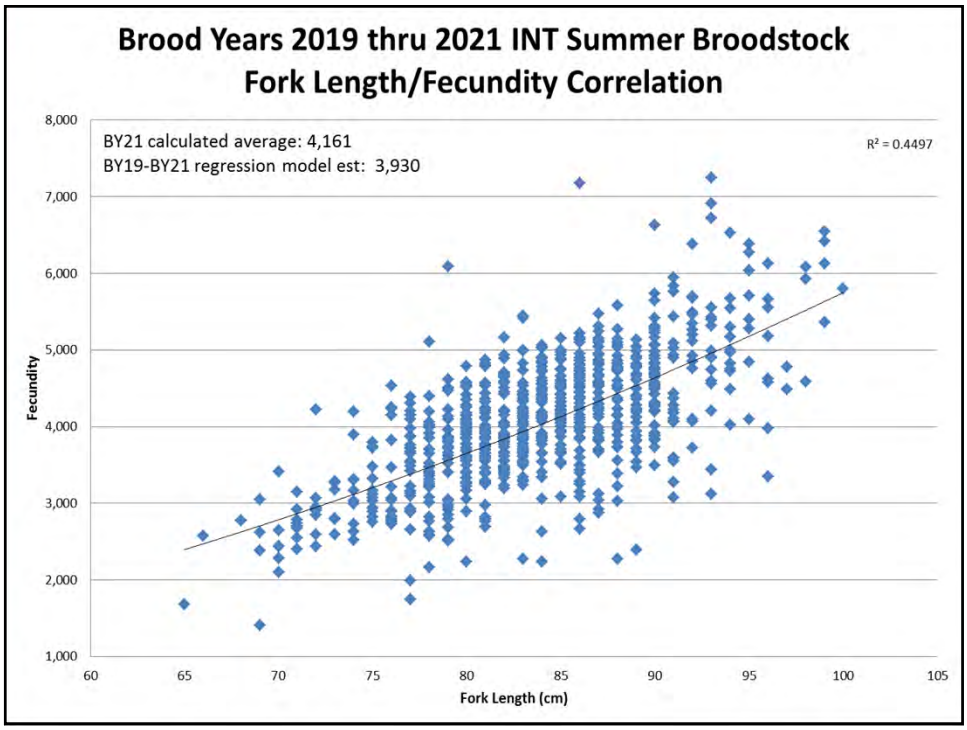
Bio-criteria standard for survival to spawn: 90%

BY21 Summer Chinook Egg Take

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




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


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

Integrated (NOR) Summer Chinook In-Hatchery Performance

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

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

Segregated (HOR) Summer Chinook In-Hatchery Performance

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

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

SEG vs INT Summer Chinook Mean In-Hatchery Performance

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

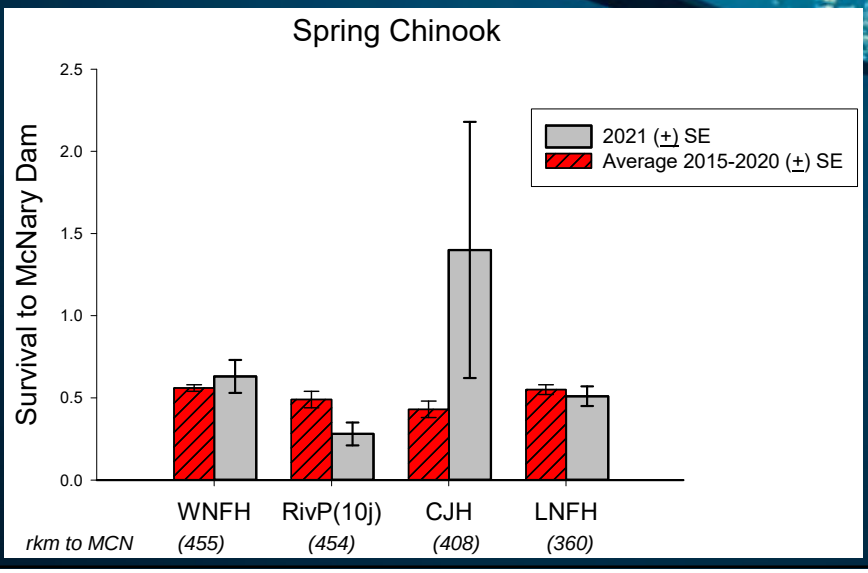
*Does not include BY20.
NOTE: No INT sub-yearlings in BY17 and no sub-yearlings for either program in BY18.

Spring Chinook 2021 Release Summary

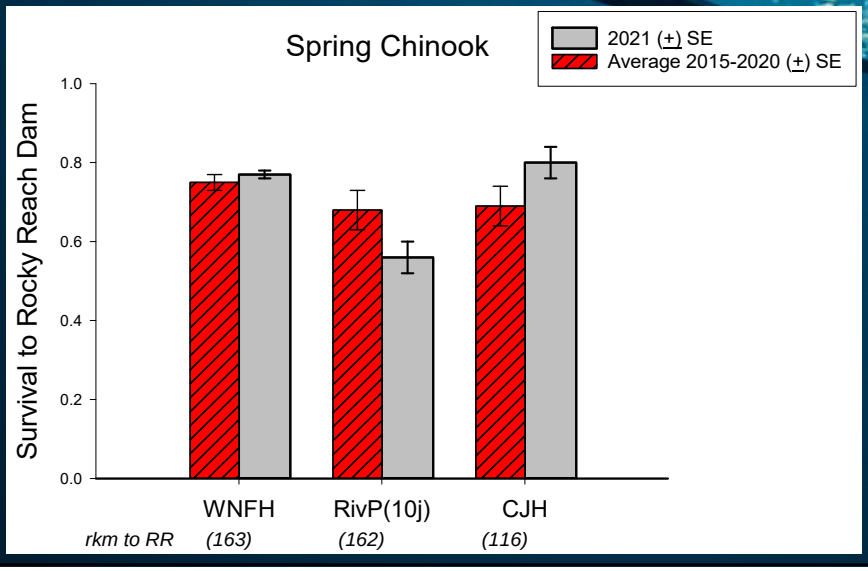
Spring Chinook

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

Survival to McNary Dam
Spring Chinook



Survival to Rocky Reach Dam
Spring Chinook



Spring Chinook Yearling In-river
Survival Summary

- McNary produced inconsistent and odd results
  - For Spr Chk its isolated to CJH Segr (same issue as Sum Chk)
  - Due to variable spill protocol?
- Survival to RRJ was in the normal range
  - Slightly low for RivP, a little higher than avg for CJH, normal for WNFH

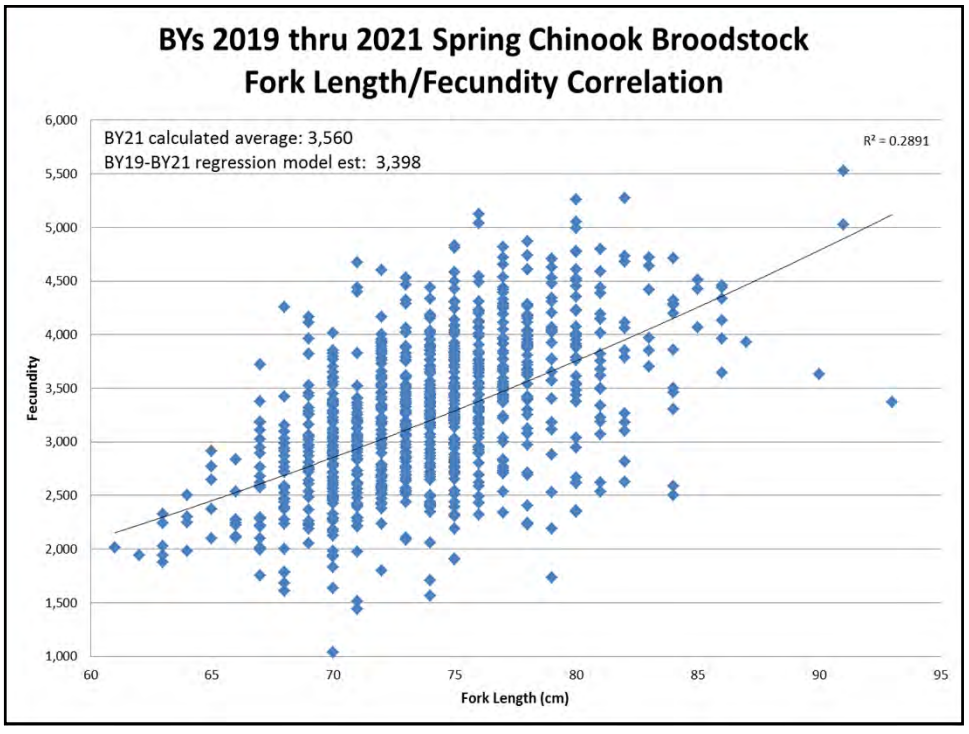
BY21 Spring Chinook Broodstock

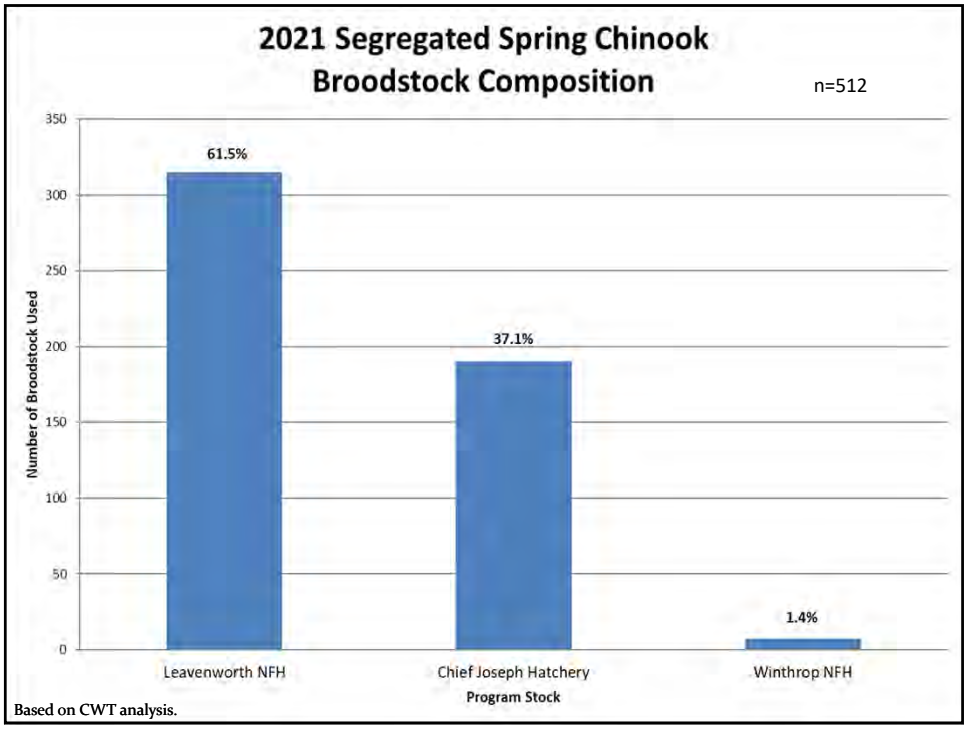
Spring Chinook – CJH & LNFH Stock			
	# Fish Spawned	# Brood Collected*	% Survival to Spawn
Females	305	324	94.4%
Males / Jacks	201 / 6	259 / 6	82.3%
Total	**512**	**589**	**89.0%**

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

BY21 HOR Spring Chinook Egg Take

- **Eyed-Egg Take Target: 787,968**
  - 942,969 CJH eyed eggs (119.7% of target)
- **Contributing factors to increased eyed egg take:**
  - Pre-spawn mortality was very low in females (5.6%)
  - Increase in number of females spawned
- **Fecundity still below expectations:**
  - Actual: 3,471
  - Assumed: 3,800





HOR Spring Chinook In-Hatchery Performance

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

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

MetComp 10j Spring Chinook In-Hatchery Performance

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

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

Key Challenges to Date

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

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

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

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

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

- **Prespawn mortality (PSM)**
  - 1/6 years has target key assumption been met for Int. Summer Chinook
  - 0/6 years for Segregated Summer Chinook
  - 1/6 years for Segregated Spring Chinook
- **Fecundity**
  - 0/6 years for Integrated Summer Chinook
  - 0/6 years for Segregated Summer Chinook
  - 0/6 years for Segregated Spring Chinook
- Low fecundity and warm water temps, resulting in Columnaris infection and thus inflicting elevated PSM, are outside of staff control. PSM will continue to be an issue without a cooler water source along with continued chemical treatment. Both are performance parameters that are consistently not meeting targets and should be re-evaluated.

Summer Chinook
2022 Projected Releases

Summer Chinook – Okanogan Stock

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

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

Spring Chinook
2022 Projected Releases

Spring Chinook

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

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

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

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

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

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

Are the program goals and Key Assumptions realistic?

Do they need adjustment or are other management actions needed?

- **Possible solutions:**
  - PSM – The need for a cooler water source is evident; we need cooler water during adult rearing to reduce Columnaris events.
  - Fecundity – adjusting fecundity to a more realistic level should be seriously considered for future brood years. However, lowering fecundity while keeping the program goals the same increases broodstock needs.
  - Production Goals – do production goals need to be reevaluated?

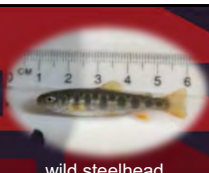
Kirsten Brudevold
M&E Biologist
Chief Joseph Hatchery Science Program

2021 Okanogan

Juvenile Chinook Monitoring
Rotary Screw Trap & Beach Seine

Rotary Screw Trap

RST



wild steelhead

We caught 16 pacific lamprey in 2021

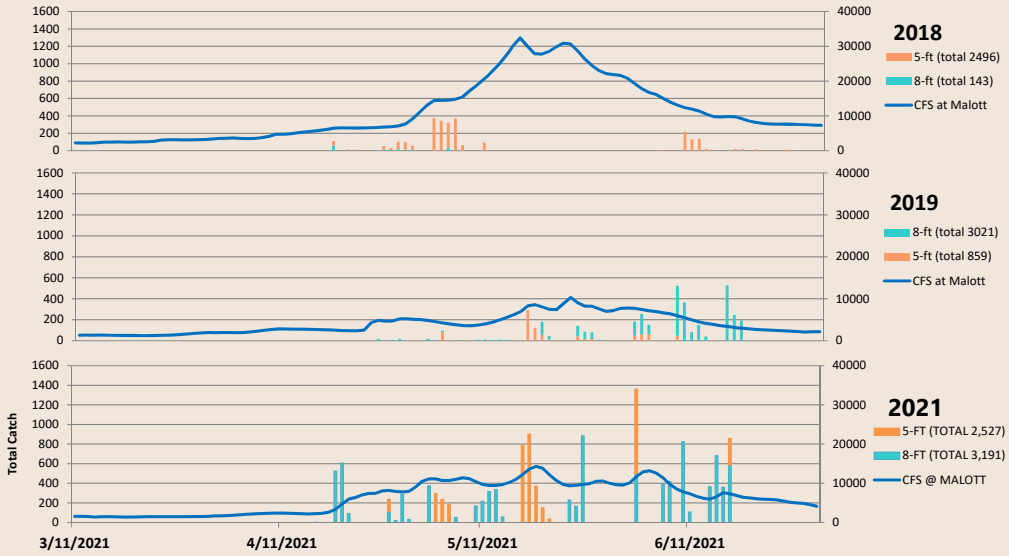
RST Configuration

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

The 8-ft cone typically fishes at the margin of the thalweg

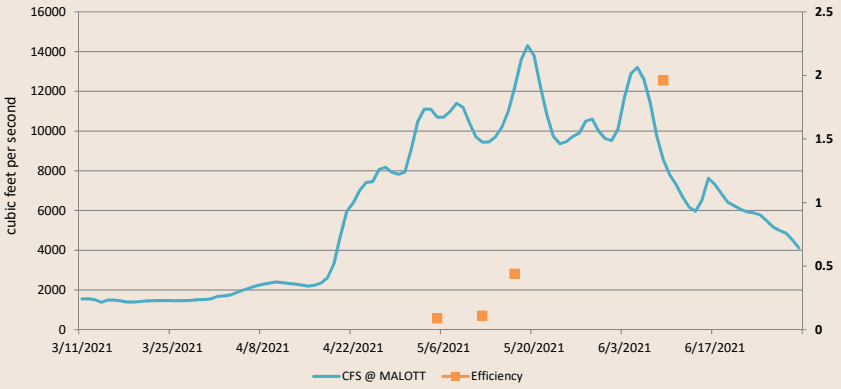
Flow vs. Total Catch

2021 was a great year for Total Catch!



Efficiency Trials

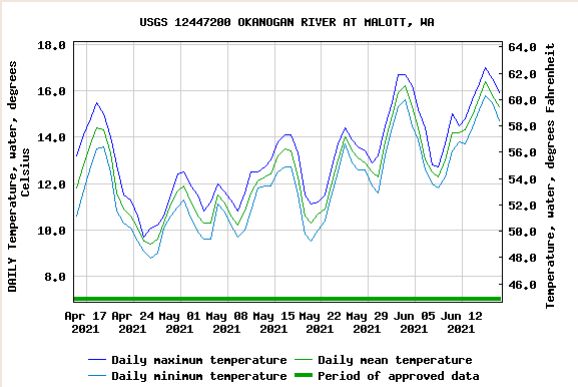
Four efficiency trials were conducted with dyed natural origin Chinook; trap efficiency was low and variable. Juvenile abundance in 2021 could not be reliably estimated.

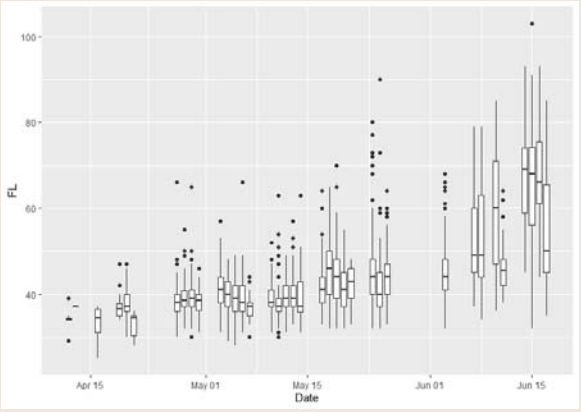


Date	Released	Recaptured	Efficiency	cfs
5/5	2,130	2	0.09%	10,700
5/12	1,900	2	0.11%	9,440
5/17	1,130	5	0.44%	12,200
6/9	662	13	1.96%	8,570

2021 was a Record Year!

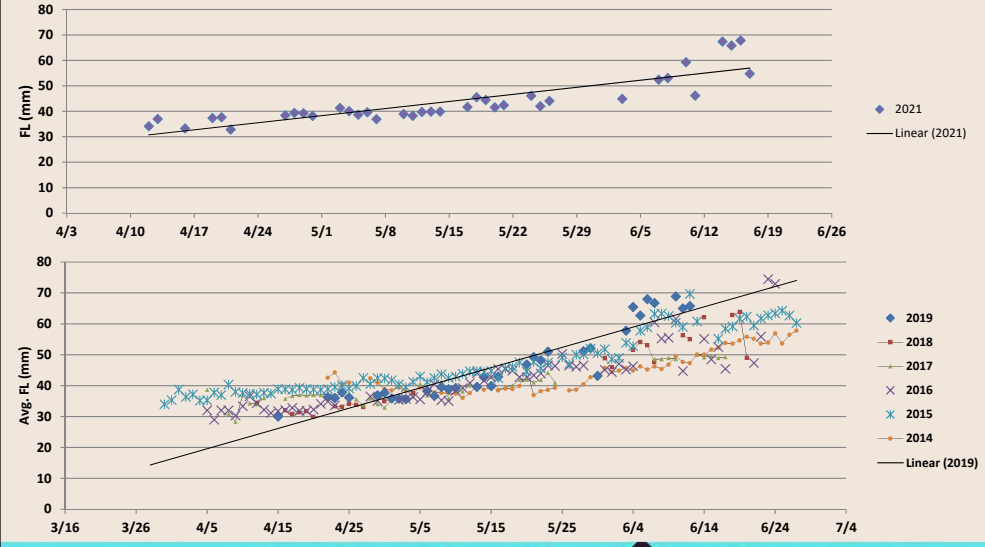
1,692 fish swam away from the RST with a PIT tag.



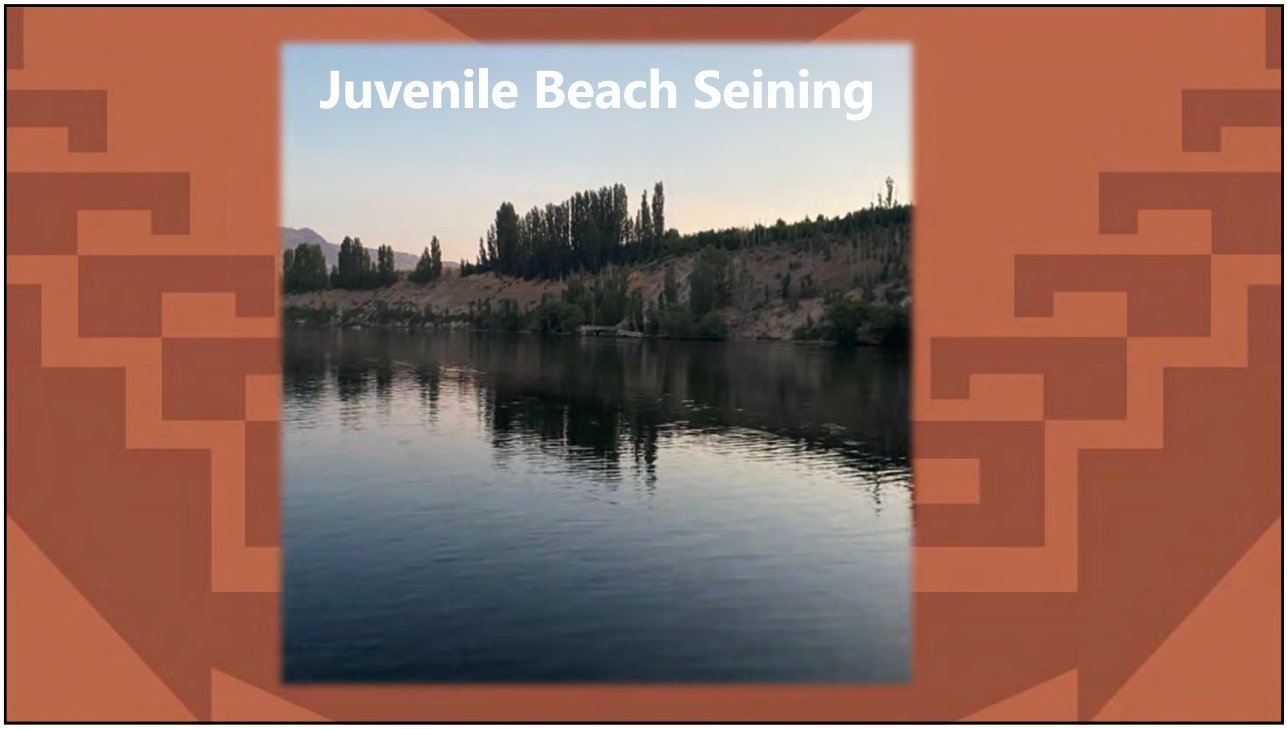


USGS Current Conditions for USGS 12447200 OKANOGAN RIVER AT MALOTT, WA

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



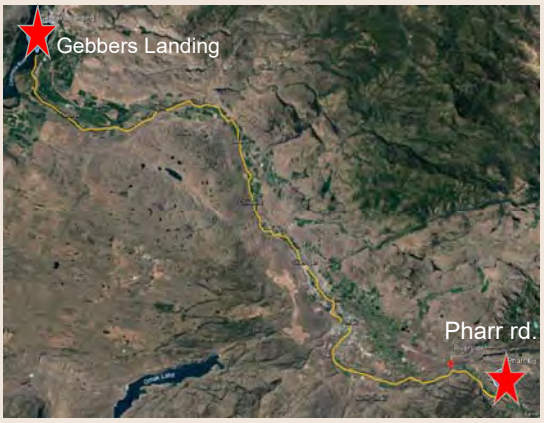
Pharr Road

Total Days Fished = 1
Total Catch = 119

Pharr Road Juvenile Habitat

Juvenile Rearing Side Channel Fall 2020

Pharr Rd. to Gebbers Landing



Total Tagged & Released = 13
No recaptures in 2021

Gebbers Landing

Juvenile Beach Seine PIT Tag Effort @ Gebbers Landing

Total Days Fished = 10

Number of sets = 79

Average sets/day = 7.90

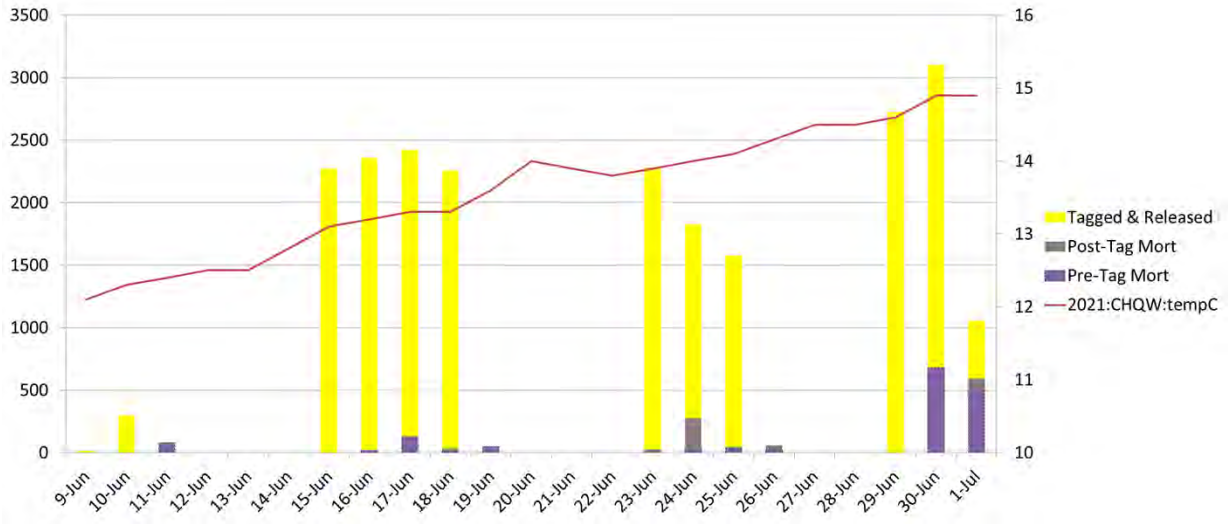
Total Catch = 29,043

Catch Per Unit Effort (sets) = 367.63

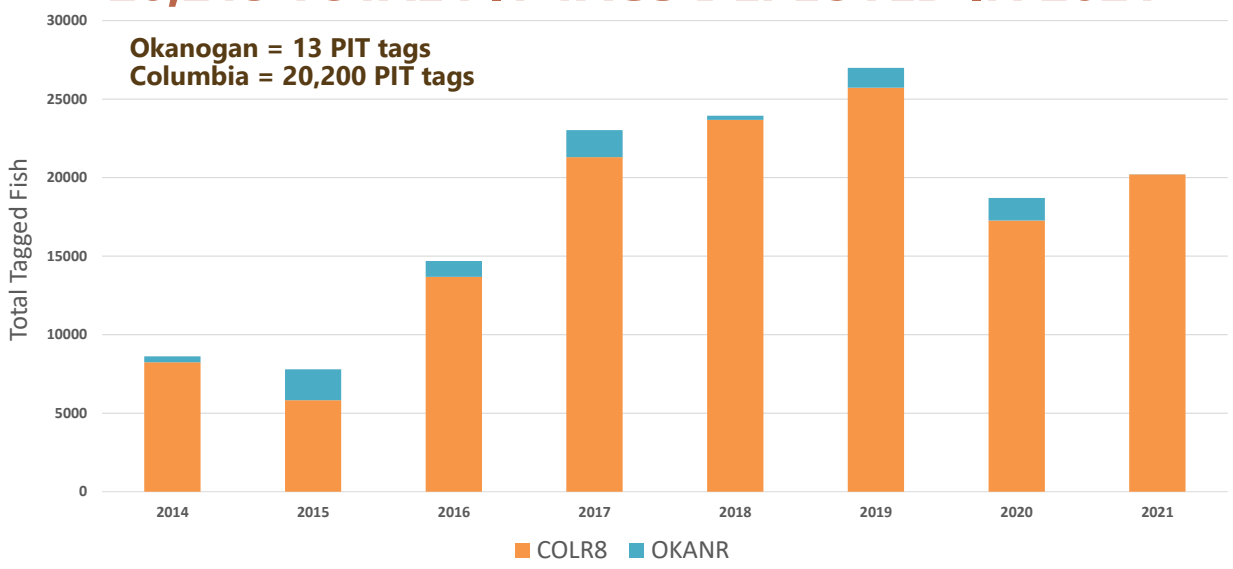
Hatchery Origin Recaptures = 379

Of the Chinook handled:

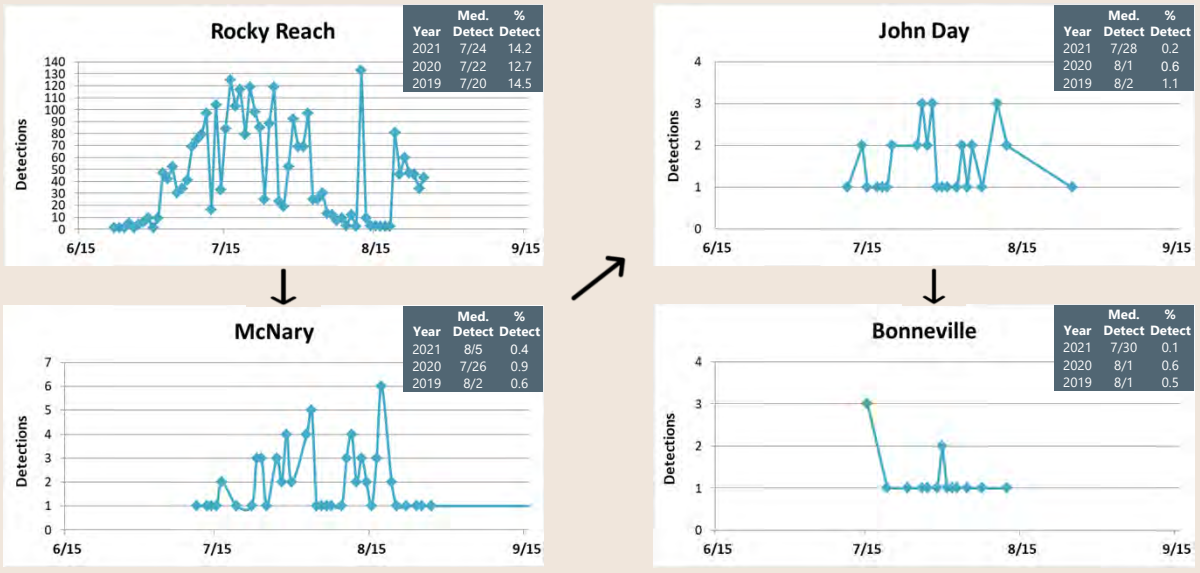
16.7% died pre/post tag, 13.2% were released untagged, 70.1% swam away with a PIT tag



20,213 TOTAL PIT TAGS DEPLOYED IN 2021

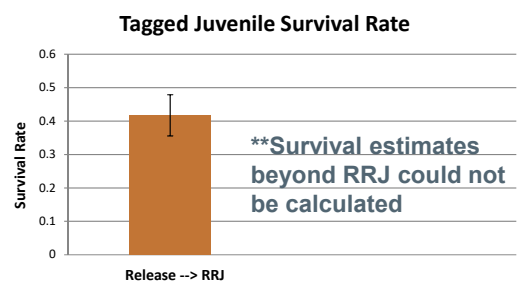


Distribution of Detections



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



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

HIGH FIVES TO OUR TECHNICIANS!

>>>Amber Cate<<<

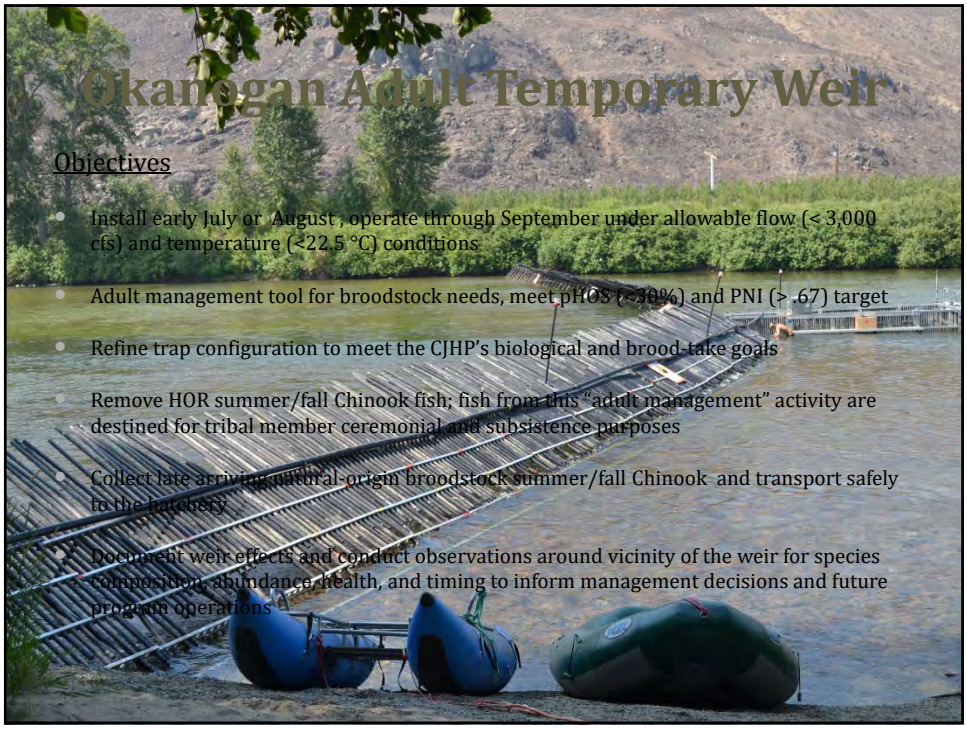
>>Jesse Marchand<<

>>John Pakootas<<

>>>Tatum Gunn<<<

>>Vertis Campbell<<


Any Questions?

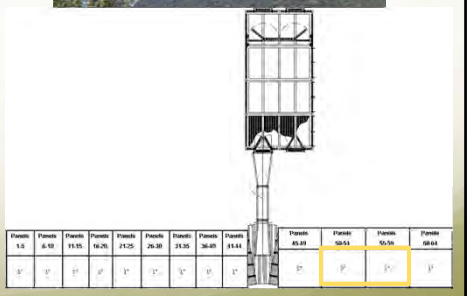


2021 Operation

- Deployed on August 2nd at 900 cfs flow @ Malott
- Completed August 10th with underwater video system
- Daily monitoring activities began following week
- Trapping began on August 18th
  - Trapped for 30 days
  - Ended on September 24th
- Configuration
  - River right- 1" picket spacings
  - River left- 1" picket spacings, set of (5) 2" picket spacings for passage, similar to previous years

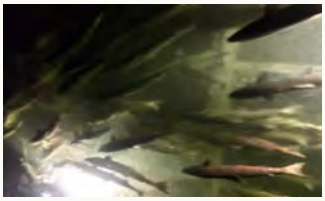
2021 Configuration and Design

- Installed the accelerator chute again
- Installed a light bar and camera housing on west side trap and two in the chute
- Moved the trap downstream
- Did not install the Whooshh™ fish transport system for brood stock collection
- Used an aerial cable system for the weir video cables again

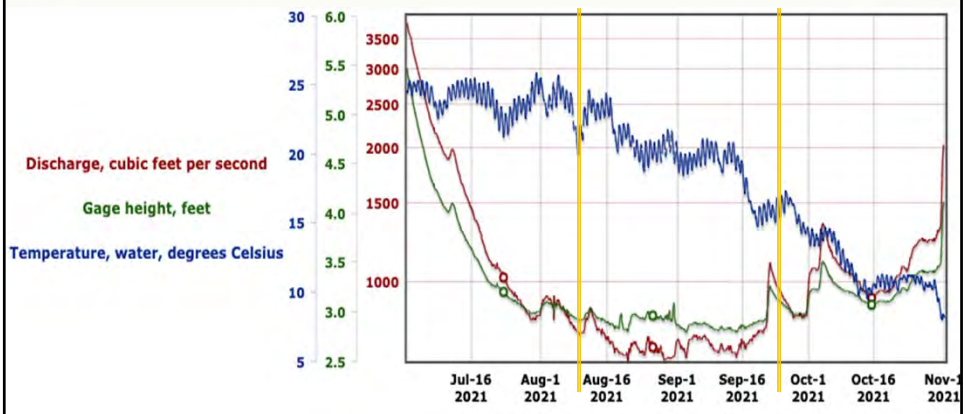


Daily Monitoring Activities

- **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-3x/day, 5 minutes, morning, afternoon, evening
  - Bank- about .8 river km downstream, 2x/day, 10 minutes
- **Mortalities**
  - Collected, assessed, biological information
    - No Chinook carcasses
    - 22 Sockeye
- **Underwater video review**
  - 2 cameras along the chute (1 DS, 1 US), 1 camera inside trap (west panel), 1 bird's eye camera on trap
  - Live monitoring to assist in daytime trapping

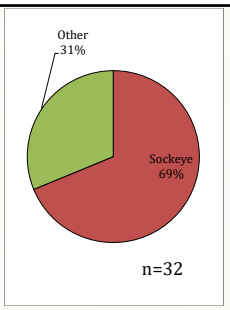


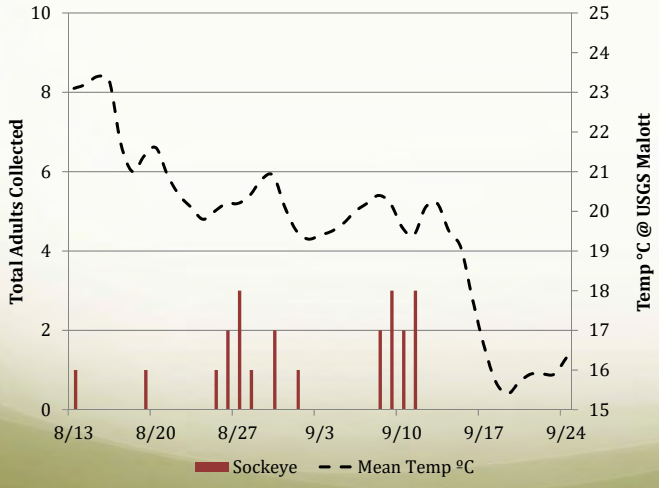
Water Quality



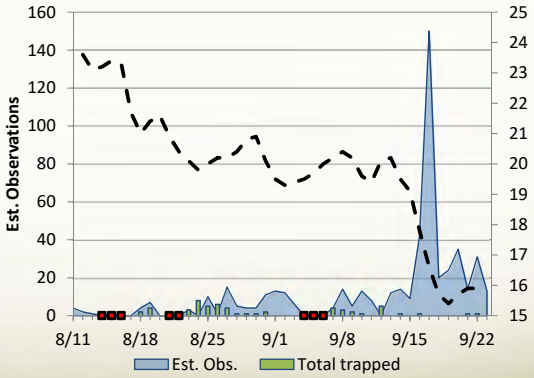
https://nwis.waterdata.usgs.gov/wa/nwis/uv?

Carcasses at the Weir

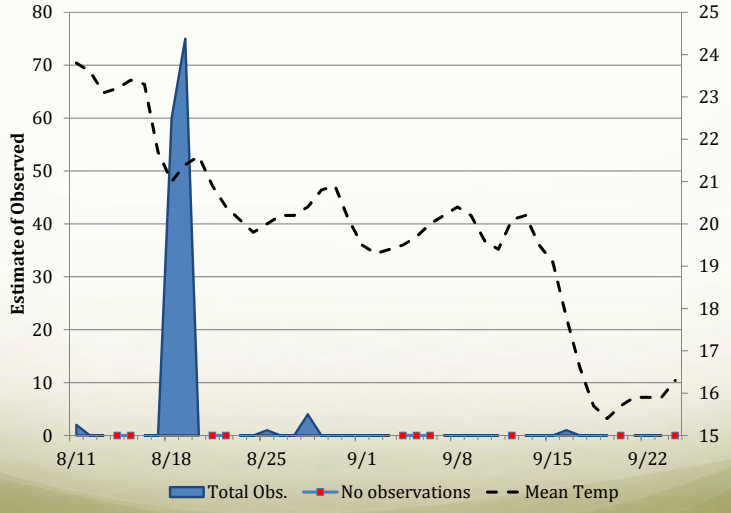




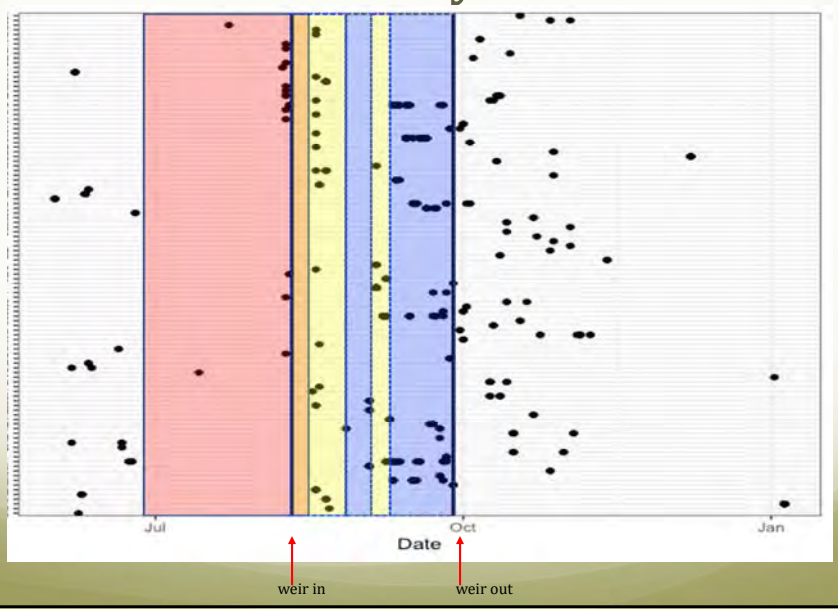
Bank Observations



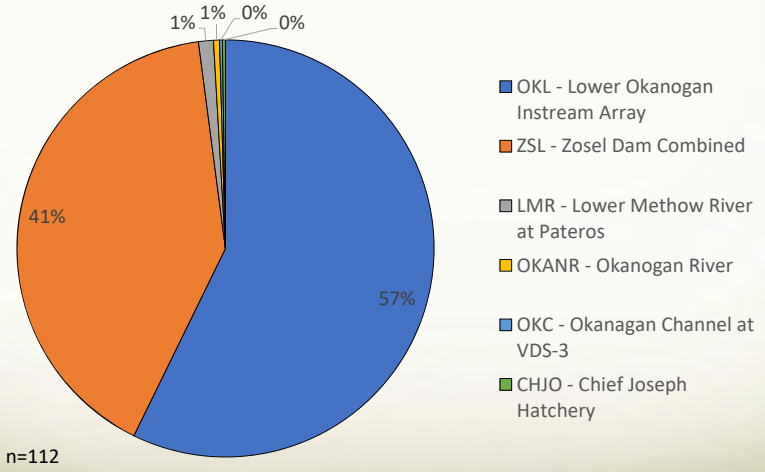
Tower Observations



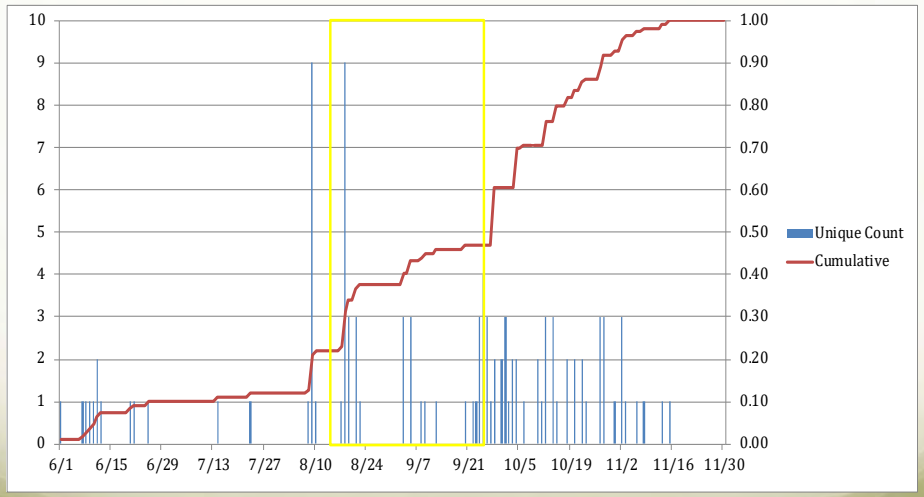
OKL Array 2021



Last Detection Site



Last Detection OKL



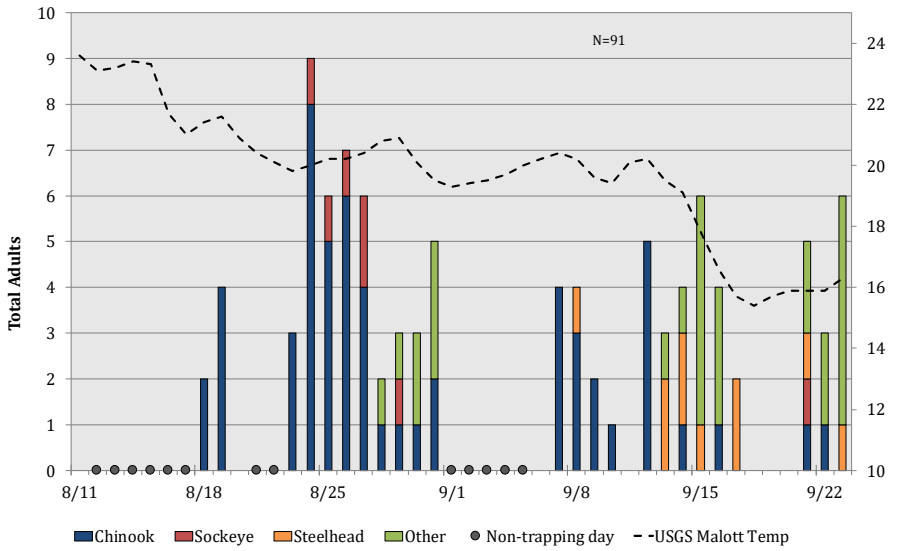
Trapping Operations

- Trapping began on August 18th, ended on Sept. 23rd
- 56 adult summer Chinook
  - 32 NOR released
  - 10 NOR brood
  - 14 HOR removed
  - 10 jacks
- 7 adult sockeye (mostly in August)
- 10 steelhead (6 ad present, 4 ad clipped)
- 8 coho in last week of trapping (all ad present)

Environmental Conditions

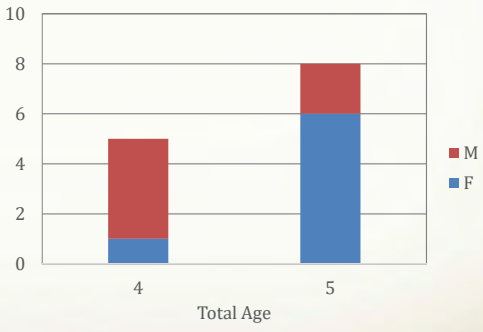
- Similar to 2020, algae was a major obstacle we had to overcome in August and early September
  - Required cleaning every 2 hours to prevent hydraulic head over the pickets and scouring
  - Maintenance physically demanding for staff- 1.5-2 hours of cleaning
    - Focused maintenance when fish not present around trap (12PM-6PM)
  - In order to operate under these conditions, requires rotating staff throughout the day
  - If unable to maintain low hydraulic head and scour, then must raise pickets and stop trapping
- If conditions continue annually then will limit our ability to trap and collect fish

Daily Trapped



CWT Results- Weir Surplus

- 14 HOR surplussed
- 13 CWTs Extracted
  - 13 tags read
- 12 Recoveries from integrated summer releases (92%)
  - 9 from Omak Pond
  - 3 from Sim. Pond
- 1 recovery from Entiat



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

[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

2021 Conclusions

- Flow not an issue for deployment- Installed in early- August at 900 cfs (maximum flow of 2,300 for current trap location) before major thermal barrier breakdown
- Based on adult pit detections at Wells and OKL, 20% of tagged fish had migrated past the weir before the weir was functional on August 10th
- Did not meet NOR brood goal for 15% component of total
- 92% of hatchery recoveries in the trap were from the integrated program
- Use similar trap location in 2022
  - Need to test the redesigned Whooshh chute so that it aligns with the point of access at the bank
- Algae was an obstacle for the second year in a row that limited trapping operations


THANK YOU TO OUR CCT FIELD STAFF
Vertis Campbell
Tatum Gunn
Jesse Marchand
John Pakootas Jr.
Tony Cleveland
Matthew Laramie
Kirsten Brudevold
Jose Acosta (intern)
Grant County
PUBLIC UTILITY DISTRICT
BONNEVILLE
P.U.D.
CHELAN COUNTY
DOUGLAS COUNTY PUD

Chief Joseph Hatchery
2022 Annual Program Review

2021 Summer Chinook Spawning Grounds Summary

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Andrea Pearl
Fisheries Biologist; Colville Confederated Tribes

Brian Dietz
Fisheries Biologist; Colville Confederated Tribes

Objectives

Monitor Status and Trends:

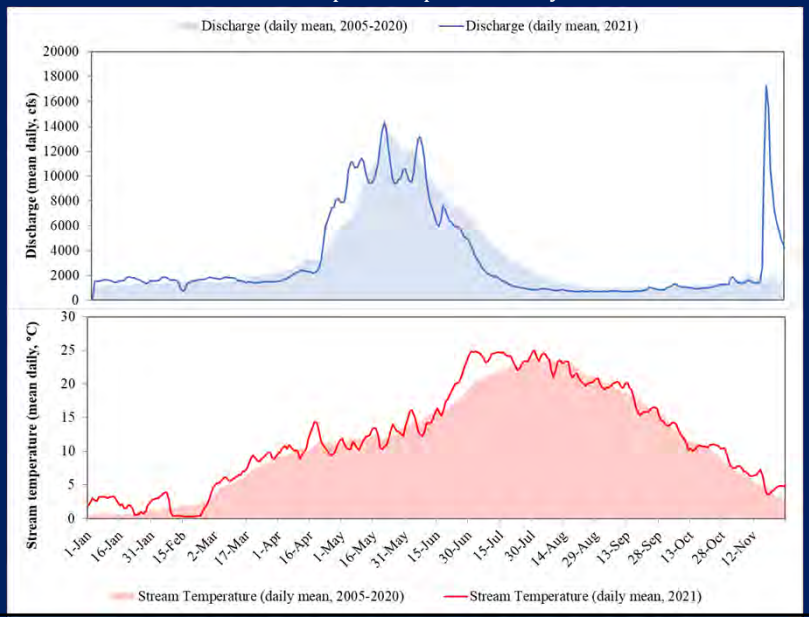
- Environmental Conditions
- Spawn timing
- Spatial distribution
- Pre-spawn mortality
- Age structure (scales, CWT)
- Stray rates
- Sex ratio
- Fish size

Estimate:

- Escapement
- Composition (pHOS)

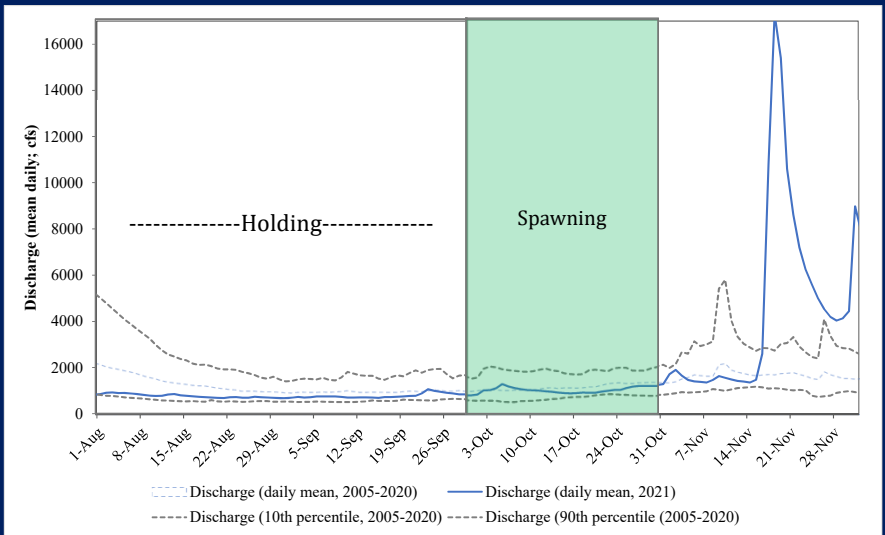
Environmental Conditions

2021 compared to previous 16 years



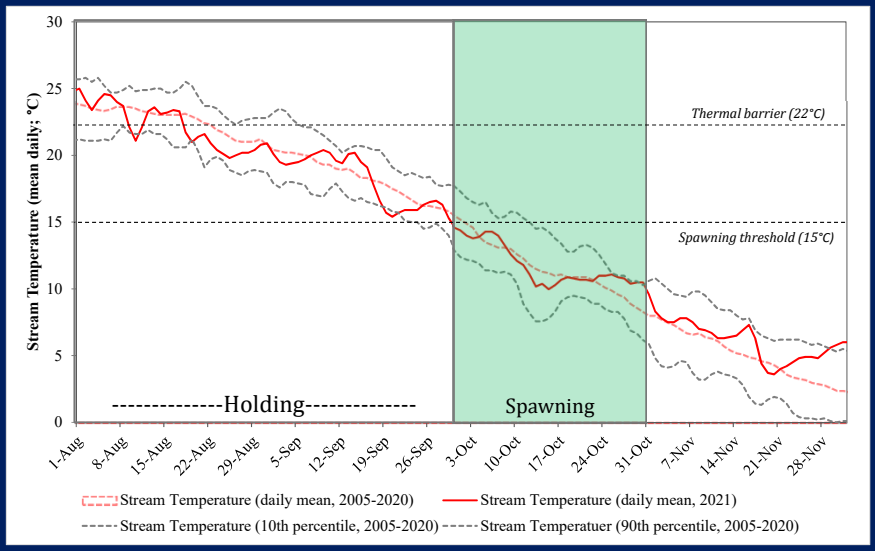
Environmental Conditions

2020 compared to previous 15 years

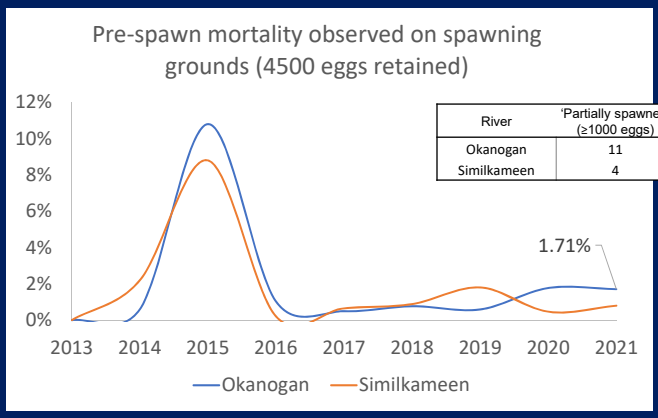


Environmental Conditions

2020 compared to previous 15 years



Pre-spawn mortality (PSM)

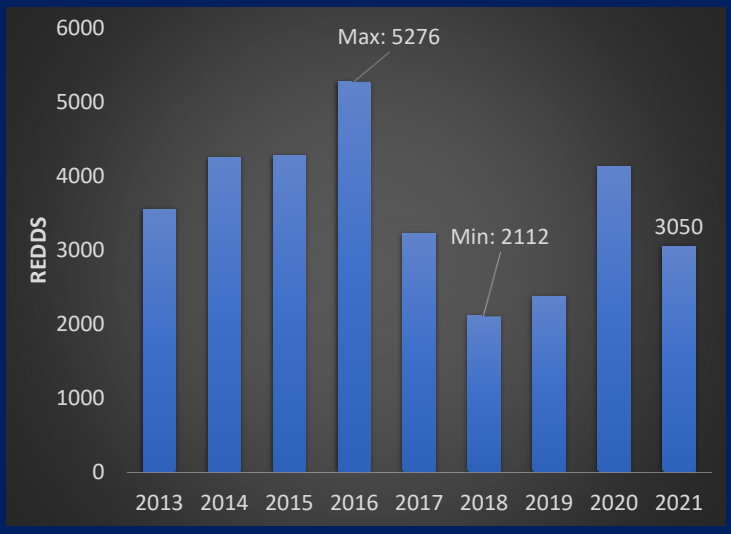


River	'Partially spawned' (≥1000 eggs)	PSM (≥1000)
Okanogan	11	2.35%
Similkameen	4	1.59%

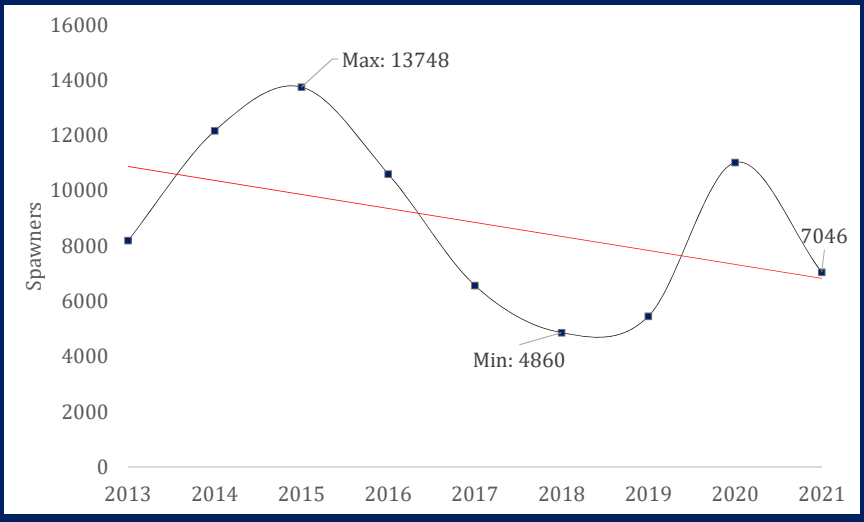
Count of recovered female carcasses (i.e., *sample size*)

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

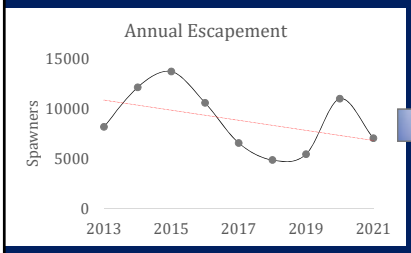
Annual Redd Counts

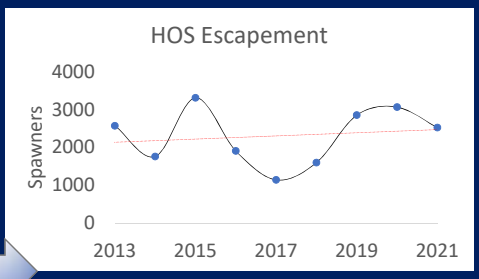


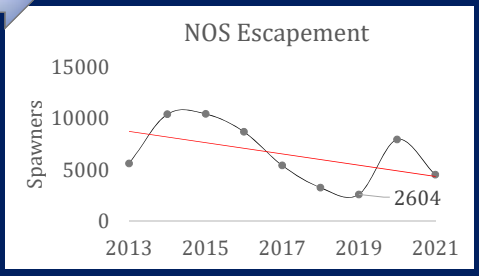
Annual Escapement



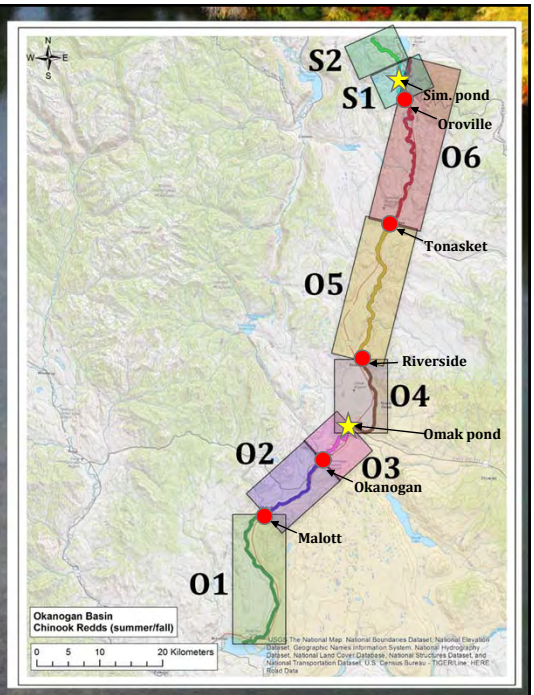
Annual Escapement

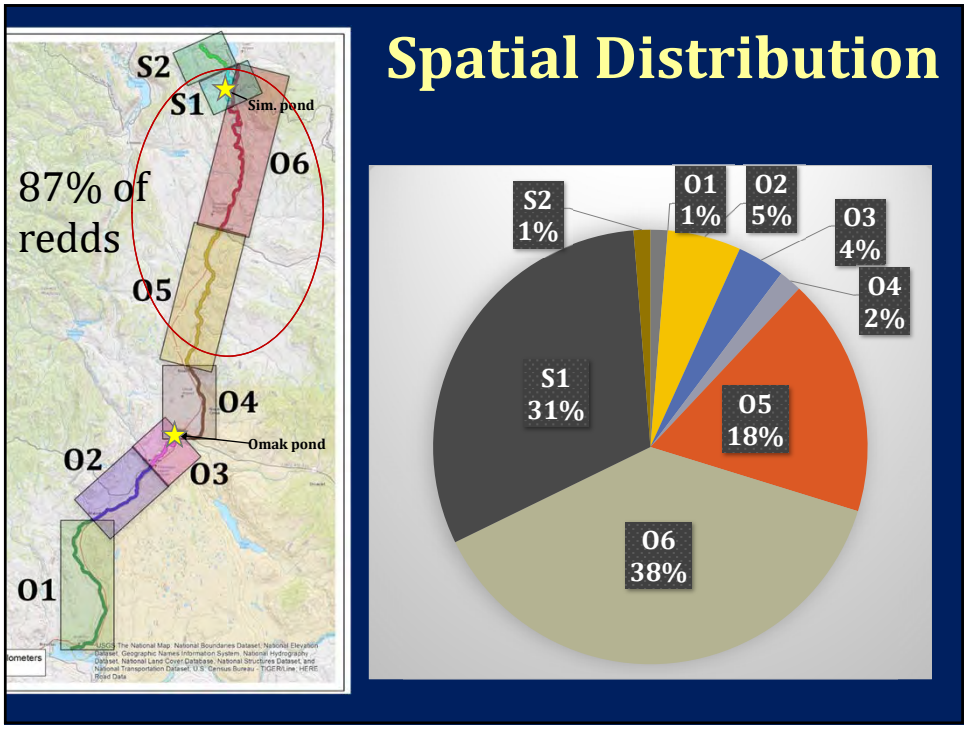


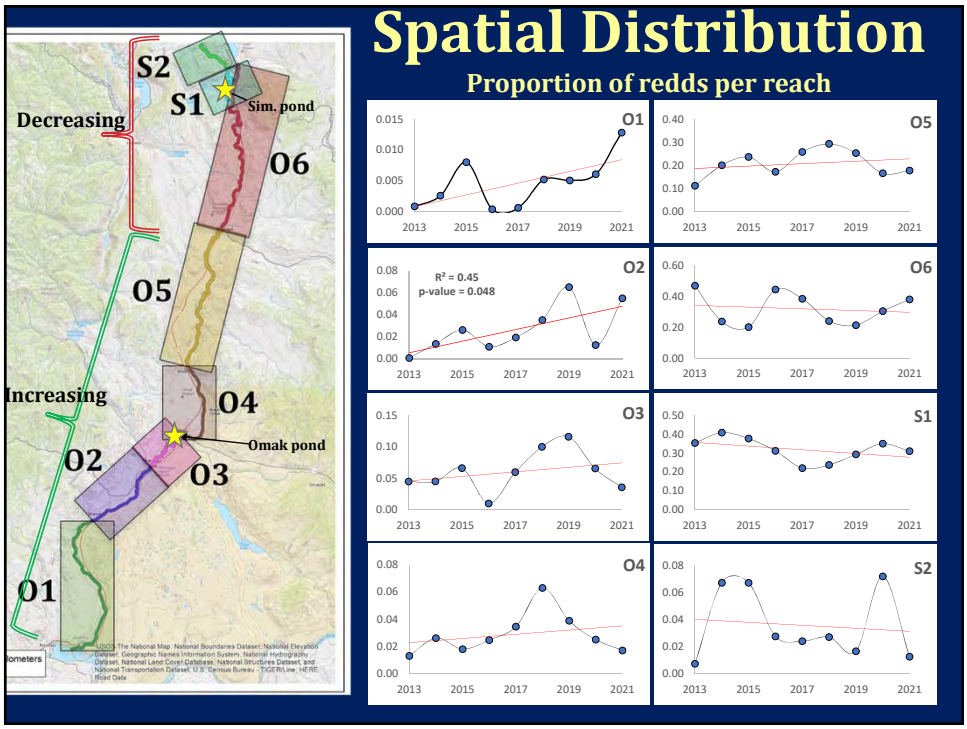


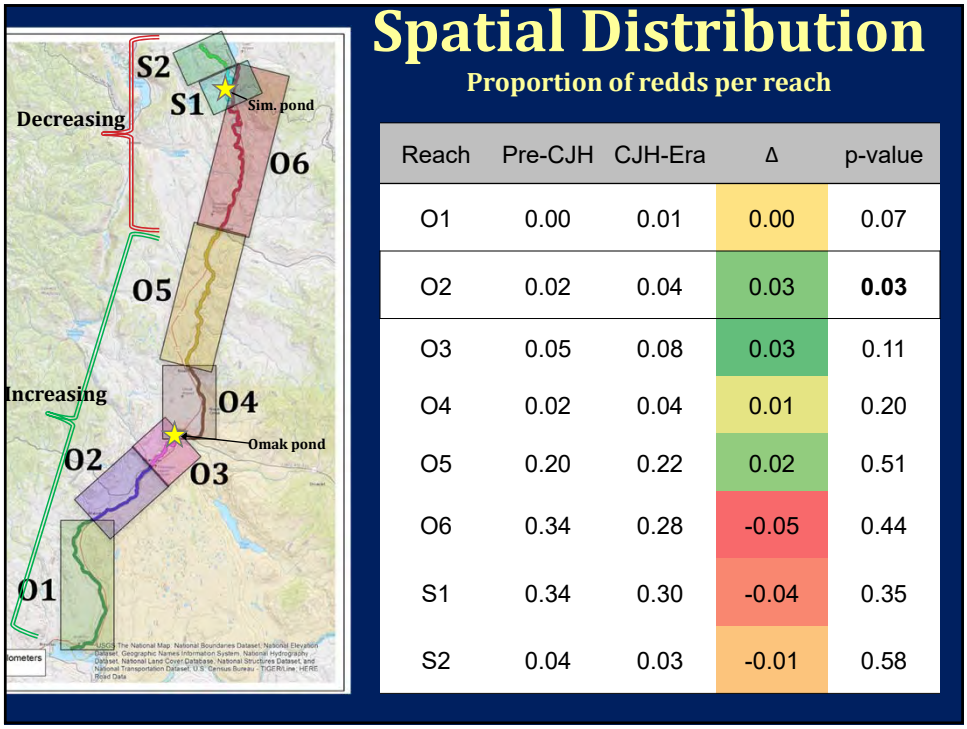


Spatial Distribution - Spawning

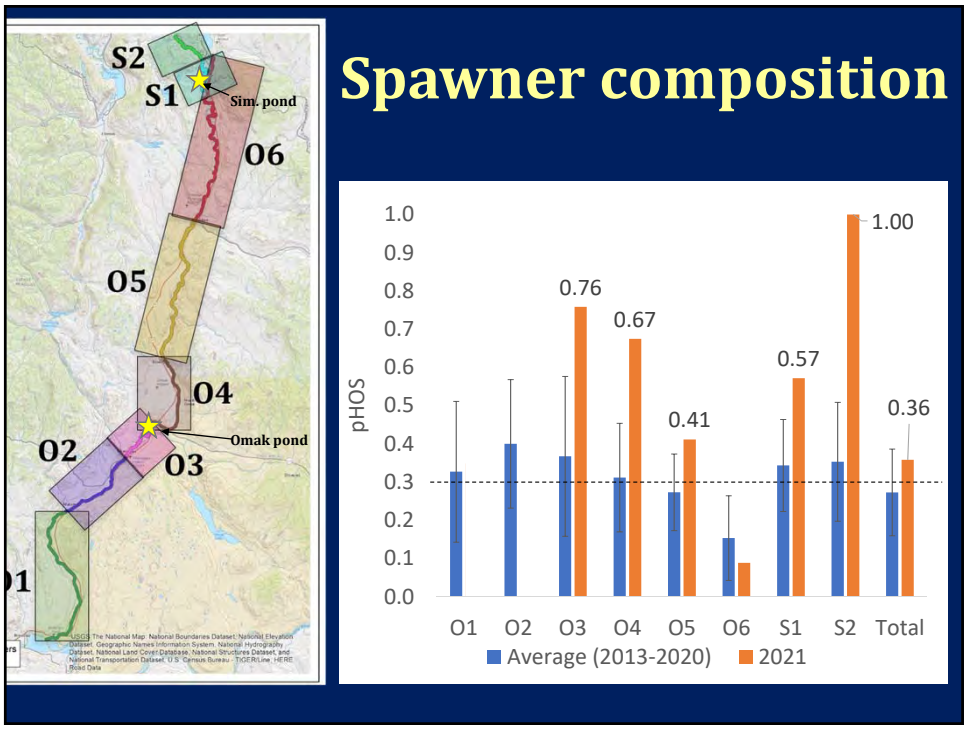



Spatial Distribution
S2
S1
Sim. pond
87% of redds
O6
O5
O4
Omak pond
O2
O3
O1
S2 1%
O1 1%
O2 5%
O3 4%
O4 2%
S1 31%
O5 18%
O6 38%

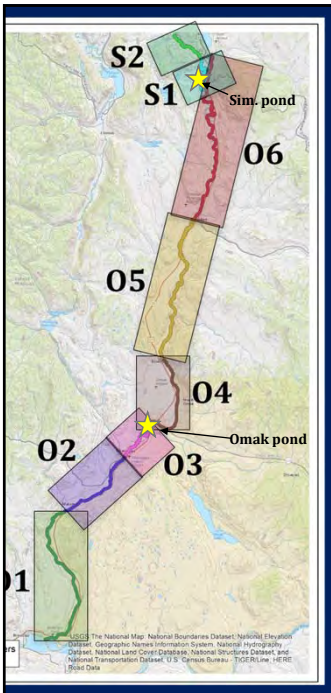

Spatial Distribution
Proportion of redds per reach
Decreasing
Increasing
S2
S1
Sim. pond
O6
O5
O4
Omak pond
O2
O3
O1
R² = 0.45
p-value = 0.048

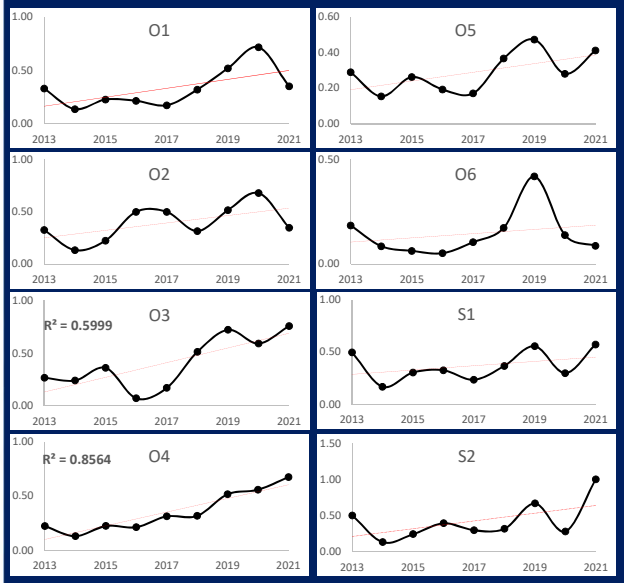


Reach	Pre-CJH	CJH-Era	Δ	p-value
O1	0.00	0.01	0.00	0.07
O2	0.02	0.04	0.03	**0.03**
O3	0.05	0.08	0.03	0.11
O4	0.02	0.04	0.01	0.20
O5	0.20	0.22	0.02	0.51
O6	0.34	0.28	-0.05	0.44
S1	0.34	0.30	-0.04	0.35
S2	0.04	0.03	-0.01	0.58

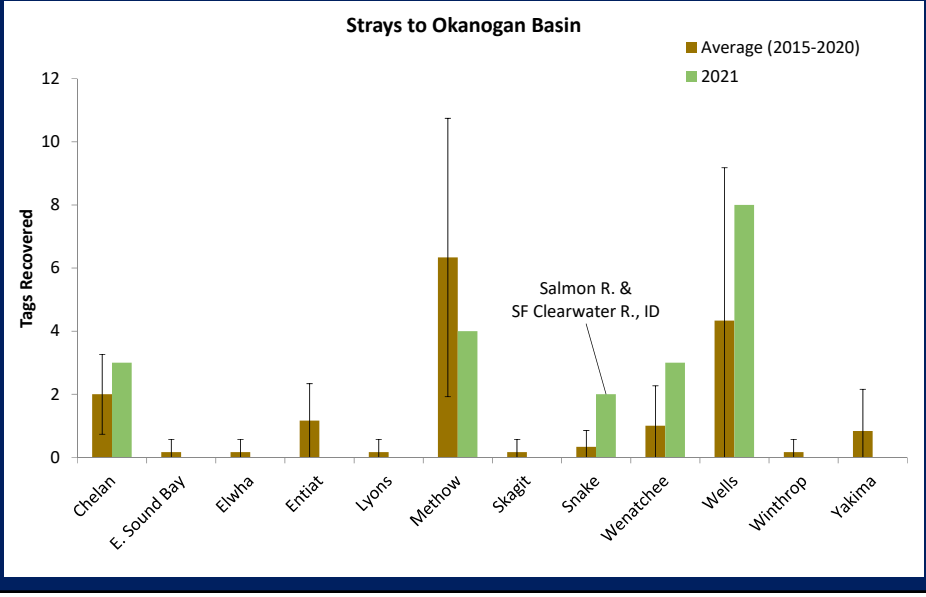


pHOS





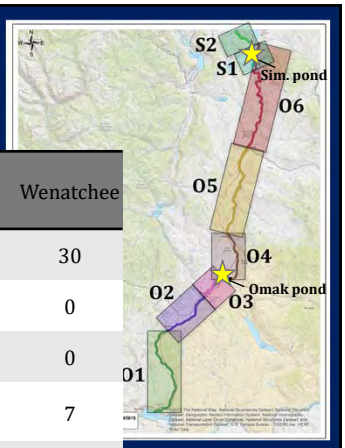
CWT Recoveries



Stray rate-into basin

(CWT-expansions)

Reach	Chelan	Methow	Salmon R.	SF Clearwater R.	Wells	Wenatchee
O2	30	0	0	0	0	30
O3	0	4	4	0	32	0
O4	3	0	0	0	6	0
O5	14	7	0	7	7	7
O6	0	0	0	0	6	0
S1	0	29	0	0	0	7
S2	0	0	0	0	0	0
Total	47	24	4	7	52	44
Percent of spawning population	0.7%	0.3%	0.1%	0.1%	0.7%	0.6%



Strays comprise *2.5%* of spawning population

CJHP strays to out-of-basin

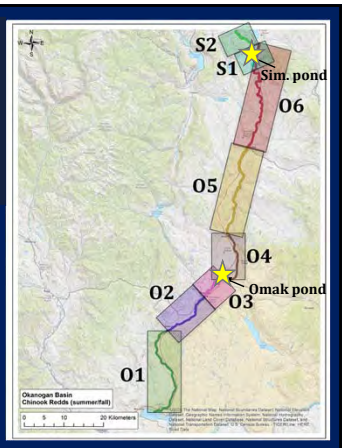
Year	Escapement	Chelan	Cowlitz	Methow	Okanogan	Similkameen	Homing	Straying
2014	241	0	0	0	121	120	100.0%	0.0%
2015	1789	4	0	0	687	1097	99.8%	0.2%
2016	2391	4	0	4	328	2005	99.7%	0.3%
2017	576	11	3	0	370	192	97.5%	2.5%
2018	191	4	0	4	116	68	95.6%	4.4%
2019	1460	12	0	0	846	602	99.2%	0.8%
2020	836	0	0	29	686	121	96.5%	3.5%

*RMIS query data from 16 March 2021

CJHP-origin returns to the Okanogan spawning grounds

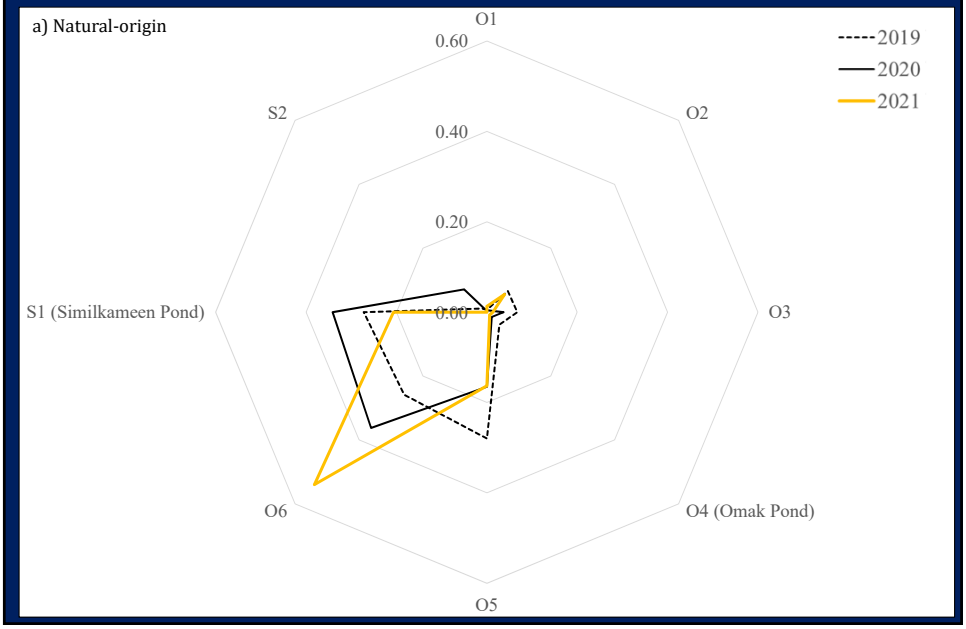
(CWT expansions)

Reach	CJH (seg)	Omak Pond (CJH Int.)	Similkameen Pond (CJH Int.)
O2	75	0	0
O3	31	85	31
O4	19	46	6
O5	19	218	236
O6	14	41	174
S1	169	42	1001
S2	0	23	65
Total	328	455	1513
Percent of spawning population	4.7%	6.5%	21.5%

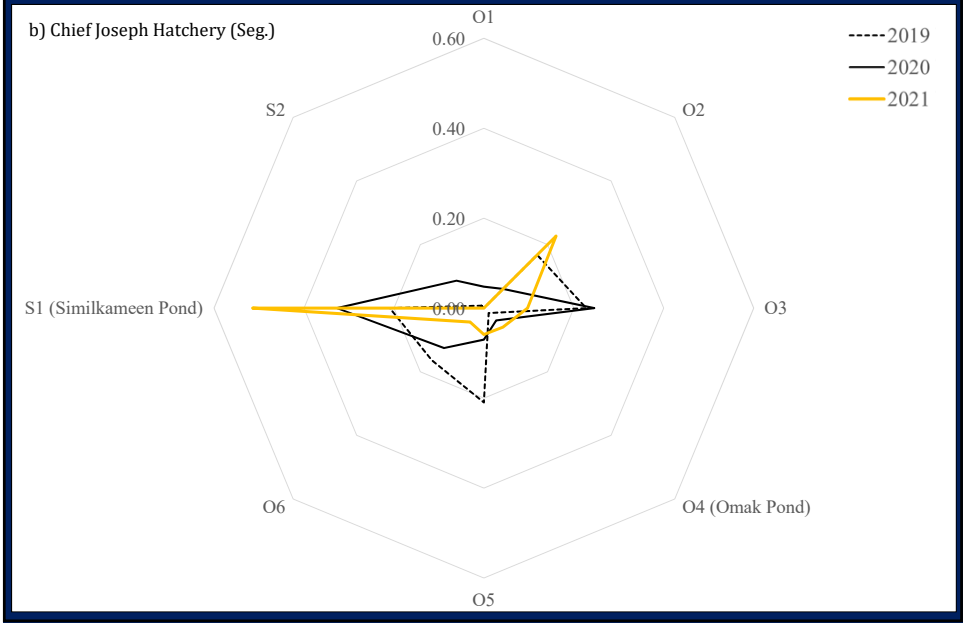


CJH-origin fish comprise *32.6%* of spawning population

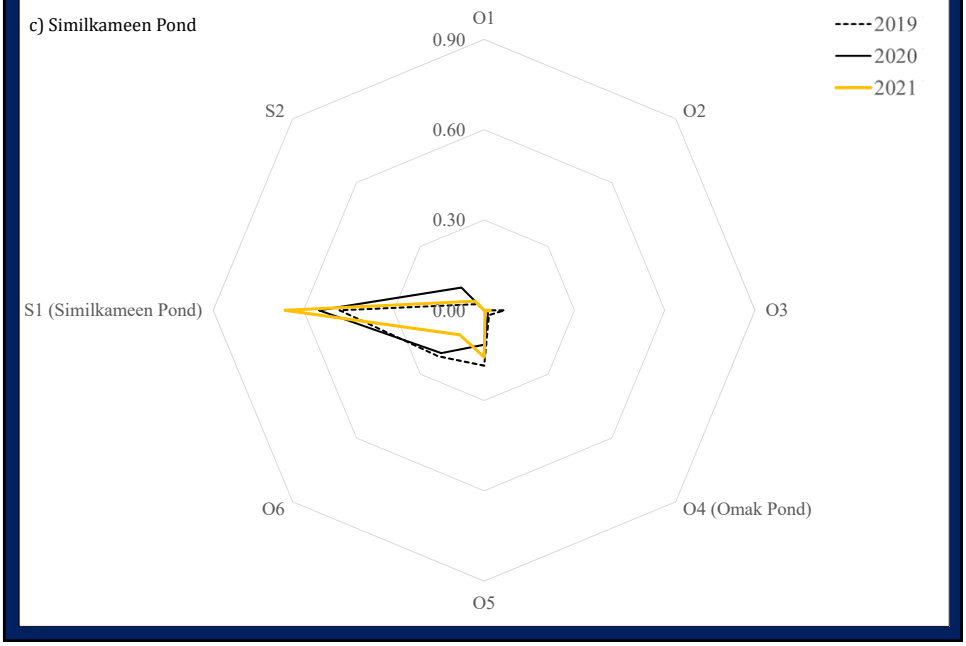
Spawner distribution



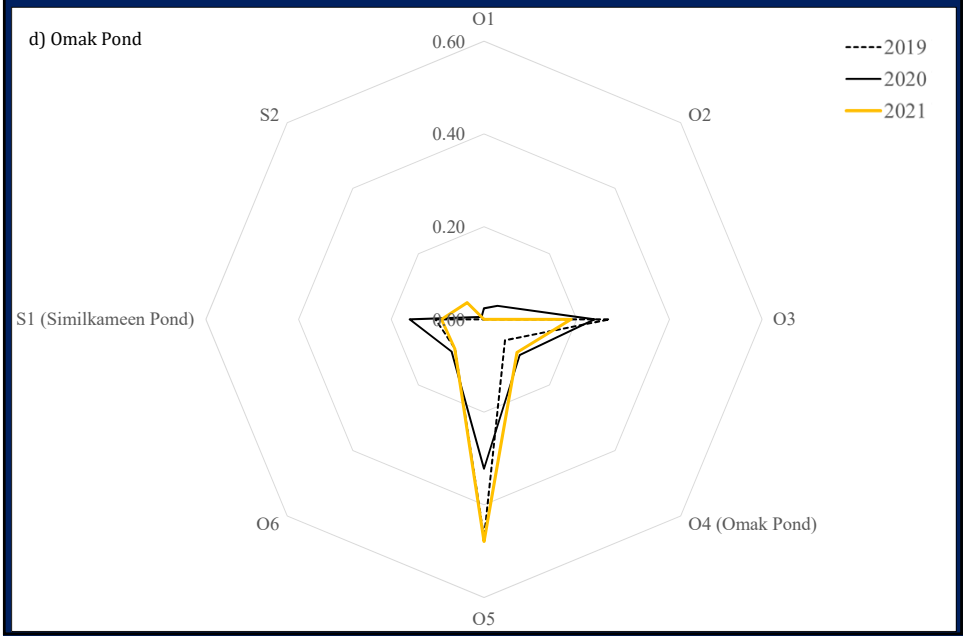
Spawner distribution



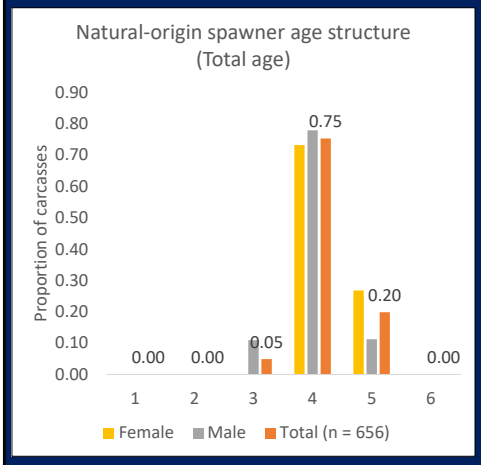
Spawner distribution

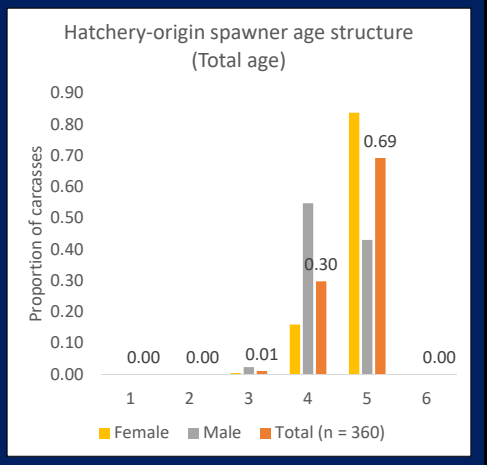


Spawner distribution



Age Structure



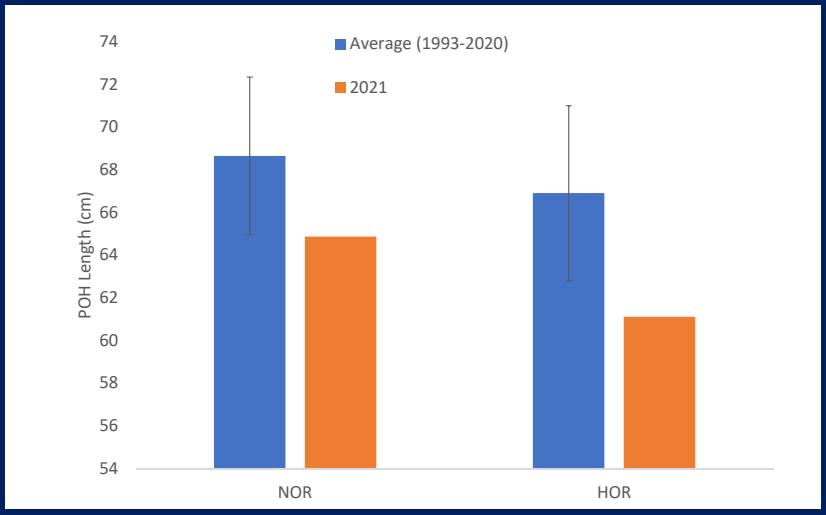


2021 Jacks

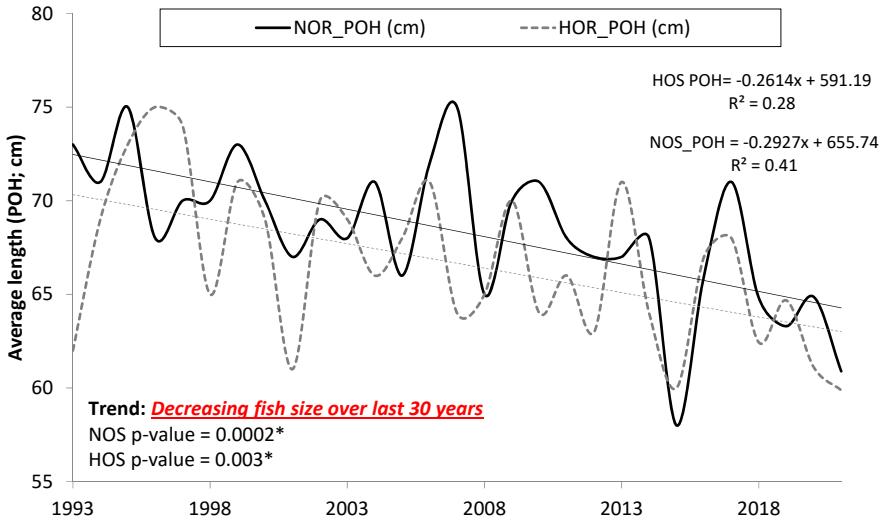
	Jacks	Adults	Total	Jack Rate
HOS	4	356	360	1.1%
NOS	32	624	656	4.9%

HOS Age Sample Rate 5.1%
NOS Age Sample Rate 9.3%

Fish size



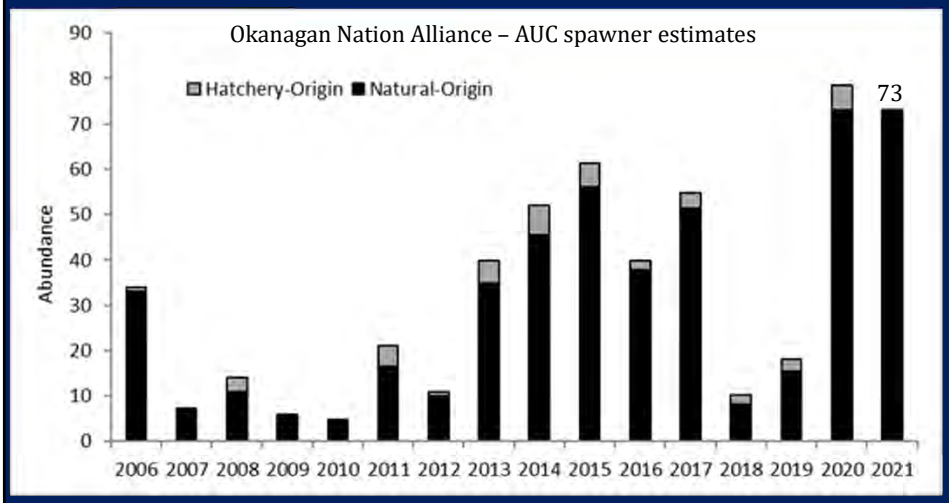
Length trend



Spawner Abundance
(USA portion of basin only)

2021	Redds	Spawners	HOS	NOS	pHOS
Okanogan	2067	4775	1186	3589	0.25
Similkameen	983	2271	1335	936	0.59
U.S. Total	3050	7046	2521	4525	0.36

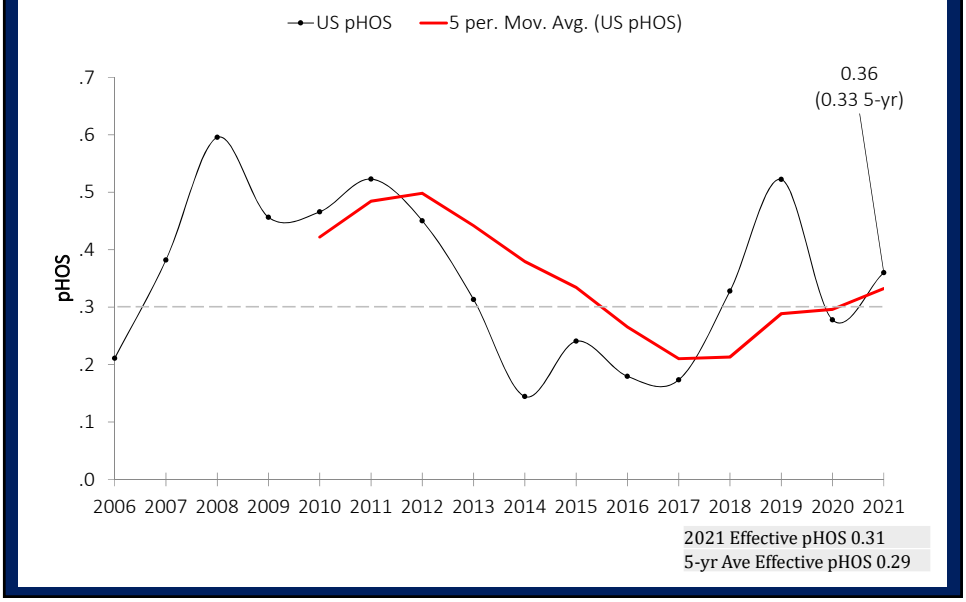
Chinook escapement to Canada



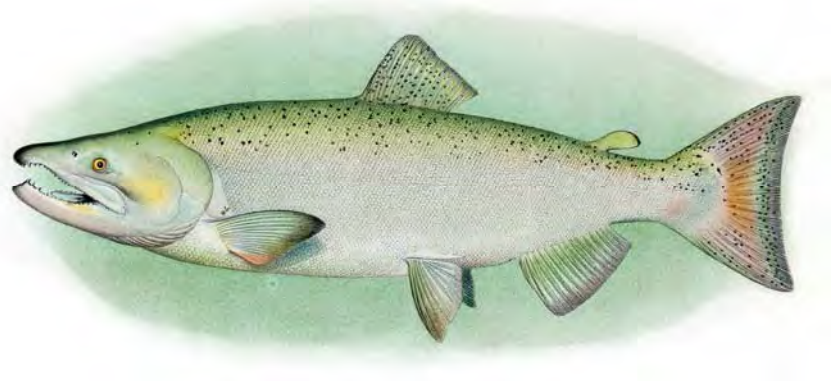
Okanagan Nation Alliance

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

Matthew Laramie (USGS Ecologist) mlaramie@usgs.gov
Kirsten Brudevold (CJHP M&E Fisheries Biologist)

Current monitoring efforts

1. PIT tags from Priest Rapids in 2021
   a) Run estimate
   b) Run composition
   c) Spawner escapement
   d) Adult spatial distribution
2. Environmental DNA (eDNA) monitoring
   a) Spatial distribution (adults)
   b) Confirm successful spawning (juveniles)
3. Visual Surveyes (redd & carcass)
   a) Redd counts (spatial extent)
   b) Carcass recoveries
4. Juvenile mark-recapture (OBMEP electro-fishing)
   a) Confirm successful spawning
   b) Juvenile population estimates
   c) Genetic analyses

PIT tags

2021 Run Estimate to Okanogan

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

Origin	PITs	Estimated Fish[2]	Proportion of Run
CJH Segregated	100	2,444	0.85
CJH Integrated (10j)	7	168	0.06
Natural Origin	11	272	0.09
Total	118	**2,884**	1.00

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

[2]*Includes all fish with last detections at CJH + Okanogan basin + a portion of the 2,494 estimated fish (102 unique PITs) with last detection at Wells (apportioned by BY release size and relative detection rates at Methow and Okanogan arrays)*

Trends

Spring-Chinook Okanogan Run Estimate; includes returns to CJH (*provided by WDFW*)

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

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[1]	**2612**	**272**	**0**	**2884**

[1]*Note: 2021 Hatchery Origin values comprised of*

- *168 10j Integrated (Riverside acclimation pond)*
- *2,444 CJH segregated*

PIT tags

2021 Run Estimate to Okanogan

2021 end-of-season PIT estimate of Okanogan spring-Chinook to Wells Dam

	Brood Year	Age	PITs at BON	PITs at Wells	Mark rate	Expanded estimate to BON	Expanded estimate to Wells
CJH Segregated	BY16	5	0	0	0.89%	0	0
	BY17	4	0	0	1.73%	0	0
	BY18	3	0	0	3.80%	0	0
	Total		0	0		0	0
Okanogan 10j / Riverside	BY16	5	4	3	2.17%	184	138
	BY17	4	20	17	2.35%	852	724
	BY18	3	0	0	19.27%	0	0
	Total		24	20		**1036**	**862**

PIT tags

2021 Run Estimate to Okanogan

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

Origin	Estimate
CJH Segregated	253
CJH Integrated (10j)	3
Natural Origin	1
Total	**257**

*13 PITs from Priest Rapids had final detection at CJH (*Est. 318 fish*)

PIT tags

2021 'Spawning Escapement' to Okanogan

Final Detection Site	CJH Segregated	CJH Integrated (10j)	Natural Origin	Total
OKL - Lower Okanogan	367	196	269	831
OKS - Shingle Creek	0	0	24	24
OMK - Omak Creek	24	0	0	24
Total	391	196	293	**880**

...Based on (n) unique PIT tag detections / expansion rate (0.0409)

FINAL DETECTION SITE	Total
OKL	34
OKS	1
OMK	1
Total	36

PIT tags

2021 Spawning Escapement to Okanogan

2021	Estimate	
Run Estimate (*WDFW*)	2884	
CJH removals	257	
Spawning Escapement	880	
Unaccounted for	*1747*	*61%*

eDNA Monitoring

eDNA – Evidence of successful reproduction

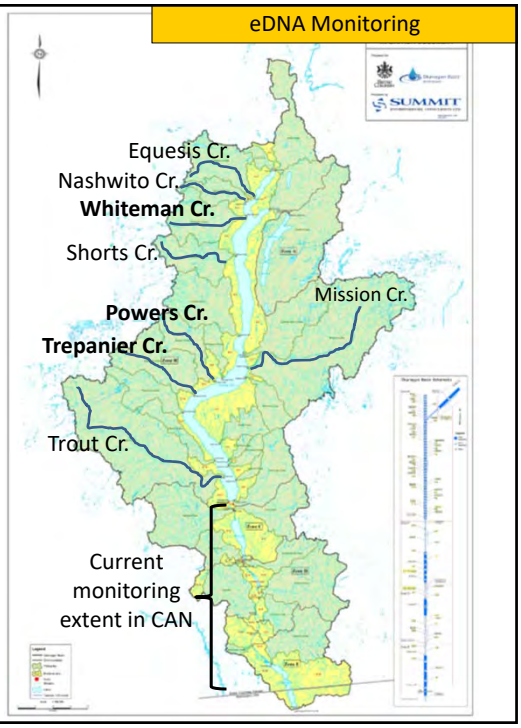
- Early detection, especially those tributaries that receive little visual survey effort
- 27 sites in tributaries
- 8 sites in mainstem Okanogan
- *Coordinating to add 8 sites in Lake Okanagan tributaries*

eDNA Monitoring

Lake Okanagan Habitat

2020

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



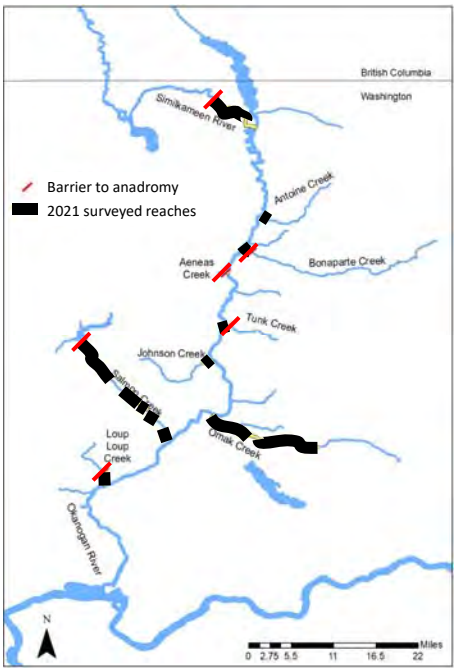
eDNA-based spatial distribution monitoring

eDNA Monitoring

Site	Jun 2012	Aug 2012	Oct 2013	Sep 2014	2015	Sep 2016	Sep 2017	Mar 2018	Sep 2018	Mar 2019	Sep 2019	Mar 2020	Sep 2020	*Mar 2021*	*Sep 2021*
US Tributaries															
Aeneas Creek			-	-		-	+	-	-	-	-		x	-	x
Antoine Creek			-	+		+	-	-	+	-	+		x	-	x
Bonaparte Creek	-	+		-		-	+	-	+	-	-		x	-	x
Johnson Creek								-	+	-	-		x	-	x
Loup Loup Creek			-	+		+	+	-	+	+	+			-	x
Ninemile Creek	-	-		-		+		-		-	-		x	-	x
Omak Creek (near mouth)	+	+		+		+	+	-	+	-	+		x	-	x
Omak Creek (above falls)	-	-				+	+	-	+	-	-		x	-	x
Omak Creek (Mission bridge)											-		x	-	x
Salmon Creek (RKM 0.6)											-		x	-	x
Salmon Creek (RKM 2.9)											-		x	-	x
Salmon Creek (RKM 7.1)	+	+		+		+	+	-	+	+	+		x	-	x
Salmon Creek (RKM 17.3)											+		x	-	x
Salmon Creek (RKM 21.9)											-		x	-	x
Salmon Creek (RKM 25.5)											-		x	-	x
Siwash Creek			+					-		-			x	-	x
Tonasket Creek			+			-		-		-			x	-	x
Tunk Creek			-			+	+	-	+	-	+		x	-	x
Wanacut Creek			-			-	+	-		-			x	-	x
Canada Tributaries															
Inkaneep Creek	-	+		-		-	-	-			-			x	x
Shatford Creek								-			+			x	x
Shingle Creek (Lower)	-	+		+		-	+	-			-			x	x
Shingle Creek (Upper)								-			+			x	x
Shuttleworth Creek	-	-		-		-		-			-			x	x
Vaseux Creek	-	+		+		+	+	-			-			x	x
Mission Creek															x
Whiteman Creek															x
Equesis Creek															x
Shorts Creek															x
Naswhito Creek															x
Powers Creek															x
Trepanier Creek															x
Trout Creek															x

No sampling due to COVID

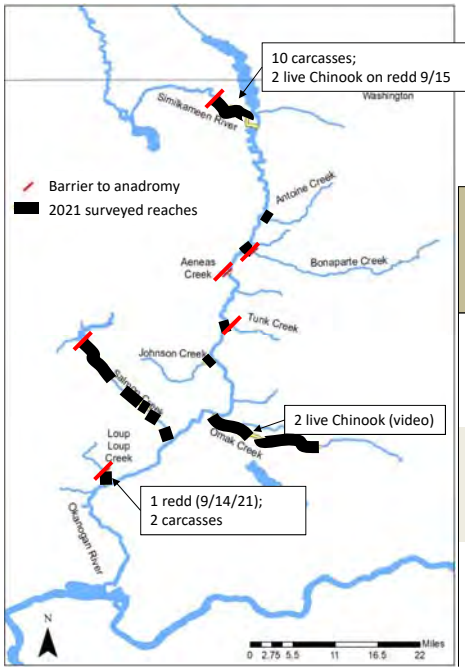
Visual redd & carcass surveys



Visual survey effort

Stream	Number of surveys	2021 Survey Date(s)
Aeneas Creek	0	-
Antoine Creek	1	9/3/2021
Bonaparte Creek	1	8/20/2021
Johnson Creek	1	9/3/2021
Loup Loup Creek	5	8/18 - 9/21/2021
Omak Creek	7	8/17 - 9/17/2021
Salmon Creek	7	8/24 - 9/21/2021
Similkameen River	5	8/18 - 9/15/2021
Tunk Creek	1	9/3/2021

Visual redd & carcass surveys



Visual Survey Results

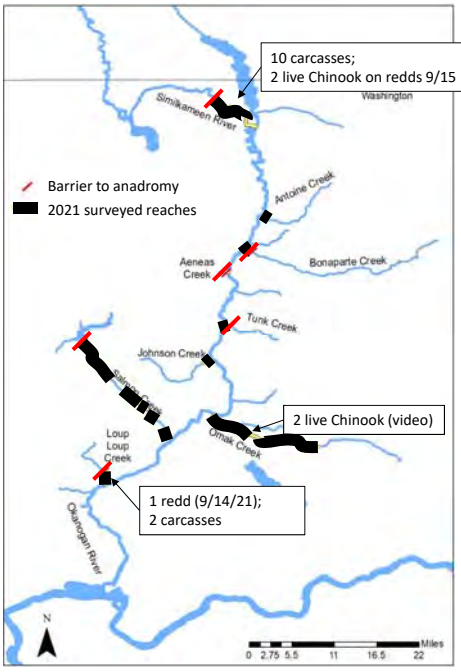
Stream	Redds	Carcasses Recovered	Live Fish Observed
Loup Loup Creek	1	2	0
Similkameen River	1	8	2
Omak Creek	0	0	2

Visual redd & carcass surveys

Carcass recoveries

Recovery Date	CWT Recovery Stream	Run	Origin
Jul 29	Loup Loup Creek	Spring	10j (Riverside Pond)
Aug 18	Similkameen River	Summer	-
Aug 18	Similkameen River	Summer	Similkameen Pond
Aug 18	Similkameen River	-	-
Aug 18	Similkameen River	-	-
Aug 18	Similkameen River	-	-
Aug 18	Similkameen River	-	-
Aug 18	Similkameen River	-	-
Sep 8	Similkameen River	Spring	10j (Riverside Pond)
Sep 14	Loup Loup Creek	Spring	10j (Riverside Pond)

Visual redd & carcass surveys



Visual Redd Surveys

Take home for 2021:

- 28 visual surveys (Aug 17 – Sep 21)
- 2 redds observed (Loup Loup Creek & Similkameen)
- Recovered 10 carcasses
  - 3 spring-Chinook (10j; Riverside Pond)
- 4 live Chinook observed

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

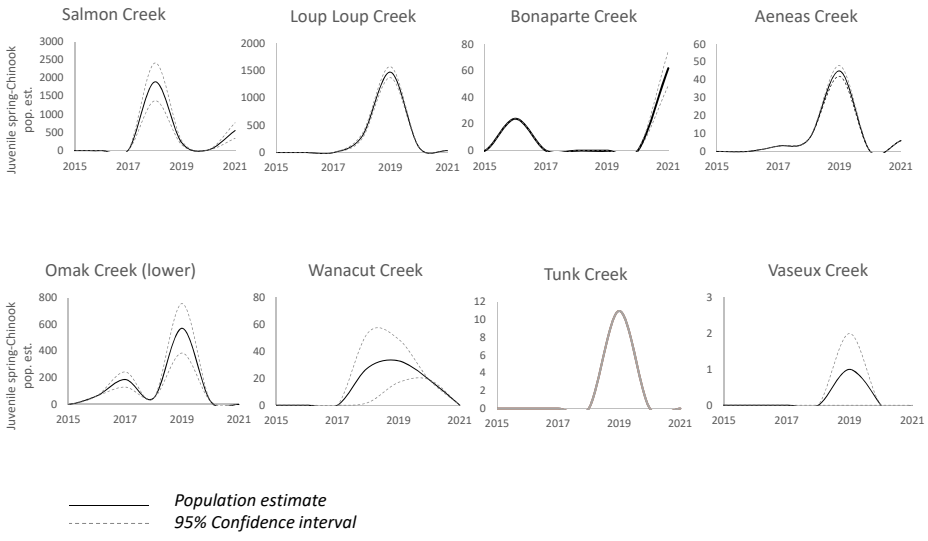
Juvenile mark-recapture (OBMEP electro-fishing)

OBMEP Tributary Surveys

Stream	Mark-Recapture Pop. Est.
Salmon Cr	553 ± 214
Lower Omak Cr	0
Upper Omak Cr	0
Loup Loup Cr	34 ± 0
Ninemile Cr	0
Bonaparte Cr	62 ± 13
Tonasket Cr	0
Tunk Cr	0
Aeneas Cr	6 ± 0
Wanacut Cr	0
Johnson Cr	Not Sampled
Antoine Cr	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

- 2019-2021 results to follow ($n \leq 100$ samples per year)

Take home

- Increasing trends in Adults (PITs) from 2014 to present
- 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

Notes

Notes

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: 2022
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 (BY16-BY21) *4,096*

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
05/15/23	06/01/23	300,000	50.0	9.1	6,000	2,722	Sub-Yearlings	Omak	Ad Clipped	100% CWT
04/15/24	04/30/24	400,000	10.0	45.4	40,000	18,144	Yearlings	Similkameen	Ad Clipped	100% CWT
04/15/24	04/30/24	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: 2022
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 (BY16-BY21) *3,944*

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
05/15/23	06/01/23	400,000	50.0	9.1	8,000	3,629	Sub-Yearlings	CJ Hatchery	Ad Clipped	100k CWT
04/15/24	04/30/24	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: 2022
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 (BY16-BY21) *3,355*

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
04/15/24	04/20/24	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: 2022
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
04/15/24	04/30/24	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

2021 CJHP APR Meeting Summary

Day 1

Tuesday March 30, 2021

2021 APR Meeting Summary
DAY 1 – Tuesday, March 30, 2021
DRAFT

DAY 1 – Tuesday, March 30

Attendees: See attached attendance list

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

9:00 – 9:10 **Call Procedures**

9:10 – 9:20 **Welcome Message and Participant Appreciation.** *Joe Peone, Kirk Truscott, CCT, MEI*

Part 2 – Data Analysis and Presentation: 2020 Year-in-Review (Packet Pages 11-20)

9:20 – 9:45 **Population Status presentation.** ***Andrea Pearl CCT***

Questions/ comments – Population Status presentation

- Todd Pearsons – Have you looked at the spatial distribution of spawning relative to the length of the river section (are they all the same size or are they different lengths)? What would the spawner density look like if you standardized for reach length (e.g., redds/km by section)?
- Andrea Pearl – There is a habitat diagnostic tool in EDT. We could do an analysis of the density of spawners within reaches. We haven't done this yet, but we have this ability.
- Casey Baldwin – NORs are spawning in upper reaches with better quality habitat; there are fewer spawners in downstream reaches. One of the program goals is to increase the spawning distribution of HORs into reaches that are currently less utilized.
- Kirk Truscott – If we are successful and a larger proportion of HORs begin to spawn in the lower Okanogan, we would expect to see a reduction in R/S for a period of time since these reaches are currently less productive; this may increase as habitat improves.
- Steve Smith – Years ago, we considered spawning ground enhancement in the lower reaches. Perhaps need to scarify the gravel bars to eliminate embeddedness.

Part 3 – Review Operating Hypothesis (Packet Pages 21-44)

9:45 – 10:15 **Review Management Framework** ***(Casey Baldwin CCT, Meridian)***

- *Logic Path: Program Goals → Management Policy → Projected Outcomes*
- *Review 2020 ISIT updates: Override tool, adjustments to broodstock management*

and terminal harvest after July 15th Wells Dam counts were available

- *2020 Outcomes versus Management Targets/ Plans for 2021*

Questions/ comments – Logic Path presentation

- Casey B. – The primary goal for the segregated program is to provide fish for harvest. There is a trade-off between running the ladder and allowing fish to remain in the river and be available for harvest. Turning the ladder off late in the season reduces steelhead take, but also tends to increases the number of CJH fish on the spawning grounds. The program goal is to limit segregated pHOS to 5%. We've exceeded that on average (8.6%), mainly due to 2019 (17%), when the ladder was run less aggressively to allow fish to escape.
- Casey B. – NOR forecast – July 15 regression forecast was pretty accurate (within 15%). PIT tag and preseason TAC forecasts were reasonably good for HORs. Segregated HORs are probably undercounted due to leaving fish in the river when the ladder is turned off.
- Casey B. – 2021 forecast is relatively good – we expect to be slightly short of the NOR goal on the spawning grounds, but we should meet the pHOS and PNI goals.

Part 4 – Data Analysis and Presentation: 2020 Year-in-Review (Packet Pages 45-125)

10:15 – 10:45 **Harvest Program and Hatchery Surplus – Year-in-Review, 2018 Data Review & Analysis.** *Isaiah Martin CCT, Brian Dietz CCT*

- *Harvest program and hatchery ladder results, (Isaiah M.)*
- *CWT presentation and results for harvest program (creel, purse seine) and hatchery ladder (Brian D.)*

Questions/ comments – Harvest presentation

- David Duvall – Isaiah presented a large number of sockeye released from the purse seine. Was this because the quota was met? Any thoughts on how well those fish survive the release?
- Isaiah Martin -- Sockeye are released due to a bottleneck in processing ability and limited storage.
- Kirk T. – A contributing factor is the purse seine targets hatchery brood for Chinook, which sound to the bottom of the net. If there are a lot of sockeye, seiners may elect to spill sockeye to get down to hatchery broodstock at the bottom. We don't know the true post-release survival of sockeye; we have information on Chinook that post-release survival is >90% based on a small sample of acoustic or PIT tagged Chinook. We think the mortality rate of sockeye is low, especially when they are just spilled from the net and not handled D..
- David Duvall - That makes sense, thanks. I thought it was a shame to go through the work to catch them only to be released. But if they can't be processed, that makes sense.

10:45 – 10:55 ***Break***

10:55– 11:30 **Hatchery Production Program, Release Numbers and Broodstock Collection – Year-in-Review, 2020 Data and Analysis.** *Matt McDaniel CCT, Casey Baldwin CCT*

11:30 – 11:45 Discussion with Partners – Hatchery program

Questions/ comments – Hatchery presentation

- Matt M. – In BY 2018, chiller leaked refrigerant into the tank water. This resulted in reduced survival. That's why release numbers are much lower than the targets. This also affected post-release survival.
- Matt M. – To meet eggtake and release goals, we need to collect more brood. We don't have the space and chiller capacity to collect more brood. We can work on increasing survival rates, but can't change fecundity. We need to adjust fecundity assumptions to a more realistic level. We probably need to address this sooner rather than later.
- Matt M. – In 2019 and 2020, several changes were made to improve prespawn survival, including acquiring a new chiller. In 2021, we will increase prophylactic treatments (Diquat); focus on fertilization procedures to increase green to eyed survival; increase monitoring of eggs during incubation; and increase cleaning frequency of rearing raceways and ponds.
- Joe Peone – Where are we on the option for the third water source?
- Maureen Kavanagh (BPA)– BPA is hoping the feasibility analysis will be completed soon. On hold last year due to Covid; we are looking at hiring a contractor this year to help address water temperature issues. We understand CCT is engaging with USACE to understand if the logistics are still feasible.
- Kirk T. – We are engaging with the Corps to evaluate the previous design and construction strategy and feasibility of drilling into the relief water tunnel. Some components are already installed, but we'll need to connect power and update the infrastructure. We are proceeding with this and assuming this is a viable option.
- Joe P. – We'll address this through the Accords negotiations.
- Rich Bussenich (ONA) – Is CCT considering monitoring thiaminase levels in broodstock and eggs based on recent research in California and Great Lakes?
- Matt M. -- We don't currently monitor this at CJHP, and I'm not aware if other programs do.
- Megan Finley – We are currently working with USGS to initiate a thiaminase monitoring program in the Columbia Basin and along the coast for several species including Chinook.
- Casey B. – Will the cooler water from the third water source allow for more broodstock to be collected or will it just increase survival of the current number collected and held in the raceways?
- Matt M. – Cooler water would just increase survival. If we added circulars it would allow for more broodstock, but otherwise it would just increase survival by reducing Columnaris.
- Casey B. – Right, the additional water source doesn't address the fecundity shortfall and space shortage if more brood need to be collected.
- Kirk T. – We need to take a look at age structure and fecundity at age. Are we inadvertently selecting younger or smaller fish in brood collection vs. what occurs on the spawning grounds?
- John A. – Will someone be presenting info on jack rates? At Similkameen Pond we have witnessed precocial fish. I've also witnessed an increase in minijacks while fishing. It seems like we have a lot of different sizes where jacking is occurring. Are data available?
- Matt L. -- I'll present a bit of insight into jack returns to the spawning grounds later on.

- Casey B. – Will GSI data be presented later on in the APR? We have been detecting early maturation as part of the GSI index.
- Andrea P. – the GSI data was not incorporated into the APR presentations, but we prepared a memo with these results. The jack rates for summers based on the GSI index for BY 2018 was 20-49% depending on the program and release site.
- Kirk T. – Jacking and minijacks do occur, and we are trying to monitor this. We think the chiller malfunction contributed to high jack rates in BY 2018. Fish hatched early and growth rates were higher due to warmer water temperatures. There is evidence that fast growth during the fall prior to release can contribute to high jack rates.
- John A. – 20-40% is alarming.
- Casey B. – The jack rate in earlier years wasn't nearly as high as in BY 2018. We'll pull this information together for next year's APR.
- Andrea P. – In previous years, the jack rate was 1-3%.
- Maureen Hess (NPCC) -- Has fecundity changed over time in general? Are fish returning at smaller sizes over time, and are other nearby facilities/programs experiencing the same issue?
- Matt M. – We haven't seen much of a change over time, but CJH is relatively new. Other programs in the Upper Columbia don't seem to be having this issue.
- Kirk T. – I believe the Bioprogramming assumption was based on the Similkameen program. We took over that program in BY13, so we could make a comparison. Did we see an instantaneous decrease in fecundity, or is it a change in methodology to come up with green egg estimate?
- Casey B. – Matt Laramie will present information later in the APR about the decrease in size of fish on the spawning grounds over time.

12:15 – 12:55 Research, Monitoring & Evaluation Program – Year-in-Review, 2020 Data Review & Analysis Summer/Fall Chinook. ***Andrea Pearl CCT, Matt Laramie USGS, Kirsten Brudevold CCT***

- *Okanogan Juvenile Chinook Monitoring- Beach Seine (Kirsten B.)*
- *Okanogan Adult Temporary Weir (Andrea P.)*
- *Chinook Spawning Ground Summary – includes CWT and scale lab results, pre-spawn mortality (Matt L.)*

12:55– 1:10 Q&A with Partners – RM&E Program – Summer/Fall Chinook

Questions/ comments – Weir presentation

- Michael Humling – The weir catch data in terms of HORs vs NORs compared to the spawner escapement estimates seemed to indicate in most years that catches were biased towards NORs and missed more HORs than NORs. Any idea why that is?
- Andrea P. – In 2020, more NORs than HORs were on the spawning grounds. The ratio of NORs to HORs in the weir was comparable to the composition on the spawning grounds. We're not selecting over the entire run, just when we can operate the weir. But during that time period, it's similar to the spawning grounds. Our ability to catch fish has gotten better each year. In 2019, we installed the weir earlier because water levels were lower.

- Casey B. – Did the thermal barrier break before August 24?
- Andrea P. – No, but there was some leakage of fish in late June and in July based on detections at the array below the weir site. The Malotte gage was incomplete, so I did my own analysis. The third week in July to end of August was when the thermal barrier was in place.
- Joe P. – Were any of the Coho captured at the weir spawners or were they morts?
- Andrea P. – Just those trapped in September. Coho were observed holding in Bonaparte Creek in November and December. No carcasses were collected during the spawning ground surveys this year.
- Kirk T. – Can you use PIT tag detections at the weir and later above the weir to determine the weir effect on fish – does the delay translate into a negative biological outcome?
- Andrea P. – No, but this is easy to look at—we can break it down by last detection date. There were quite a few that were re-detected.

Questions/ comments – Spawning Ground Surveys

- John A. – Have you looked at incubation temperatures below Zosel Dam? We have found that spring spawners do not survive due to rapid warming. Do we have a minimum winter flow threshold below Zosel to protect incubating eggs? With Steelhead, we did a simple modeling exercise with thermal units to see the likely window of emergence and temperatures during that period. This would be an interesting exercise for Chinook as well.
- Matt L. -- We are aware of the issue. Juveniles are not immune to thermal issues. We have not directly assessed it. We have done a trial study with egg boxes in that area of the Okanogan, but not a lot of data. There is some water management upstream, but not sure how that could be managed.
- Todd P. – Thanks for the information on spawner density per reach. Looks like reasonable spawner densities in O3, but then in other graphs it looks like a fair number of fish are going to an acclimation site, but bypass for spawning like we see for spring Chinook in the Yakima.
- Matt L. – It would be interesting to look at spawner distribution on a finer scale, but we don't have redd data.
- Casey B. – It appears that Omak fish are not returning to the Similkameen at a high rate, which is good. The program has spread out the acclimation to two sites and is not increasing spawner density in the Similkameen. If the Omak site was putting a lot of fish in the Similkameen it wouldn't be as good of an outcome as we are observing in lower reaches.
- Matt L. – Yes, Omak fish don't appear to be using Reach 6 – this is a stronghold for wild fish.

1:10 – 1:45 **Research, Monitoring & Evaluation Program – Year-in-Review, 2020 Data Review & Analysis Spring Chinook**. *Casey Baldwin CCT, Matt Laramie USGS, Kirsten Brudevold CCT*

- *Overview of SARs, PIT analysis*
- *Chinook Spawning Ground Summary*

1:45- 1:55 **Q&A with Partners – RM&E Program – Spring Chinook**

Questions/ comments

- Todd P. – It looks like a fair number of spring Chinook are returning, but why are there so few redds?
- Matt L. – We had good spatial coverage on our redd survey, but we may need to do repeat surveys to make sure we aren't missing redds.
- Casey B. – We don't have a PIT tag array in the Similkameen, and fish are likely to be present there, but we aren't detecting them. This is a thermal refuge.
- Todd P. – If redds were present, are they detectable? Would you be able to see them?
- Kirsten Brudevold – This year, Salmon Creek had high water and high turbidity levels, so it was almost impossible to see the creek bottom.
- Matt L. – In the Similkameen, we should be able to see redds. If there was substantial spawning, we would see it in early aerials. There is no reason we would not be able to see them.
- John A – Is it this year WDFW is starting representative tagging at Priest Rapids? That will greatly increase the number of PIT tags to detect and make it less variable.
- Andrea P. – yes.
- John A. – They are tagging adults as they return, so you'll get more fish. Wells tagging hasn't been representative of the run so expansions are hit or miss. We need another PIT tag array in the mainstem Okanogan. Distribution is high in lower river in coldwater refugia, but we don't have another redetection point, so we need to push for another PIT array.
- Jeannette Finley – Are you using a drone for redd surveys?
- Matt L. – No, these are fixed wing aircraft surveys.
- Kirk T. – Are PIT tag arrays in the tribs able to determine behavior (direction of movement)? Are they double arrays so we get directionality? Were they entering or leaving Johnson Creek during the spawning period?
- Matt L. – The plots in the slides just show the location of final detection. Tracking the movement of each fish involves a lot of data. We can take a closer look at this.
- Kirk T. – We have indication spring Chinook are present in various tribs, but foot surveys don't detect fish or redds. It's important to make an assessment of PIT tag hits to see if any correspond with spawn timing.
- Matt L. – You could write off several and say they weren't successful in spawning, but if there are 93 detections in a short section, it's hard to say they aren't spawning.
- Andrea P. – We do look at detections when setting up foot surveys. PIT detection timing is used to determine when and where to focus spawning surveys each week.
- John A. – Johnson Creek is a single array. All the other arrays have more than one antennae, but don't always get multiple detections, so directionality isn't all it's cracked up to be. Timing should be a relatively easy fix for modifying estimates.

1:55 – 2:05 Wrap-up, Actions, Discuss Key Issues for Day 2. *Andrea Pearl CCT, DJWA*

Questions/ comments

- Casey B. – Thanks to presenters and staff of the monitoring program for all your hard work collecting data and presenting it here.

- Andrea P. – Tomorrow, we'll take another look at our management targets for the upcoming season and program assumptions in the ISIT tool, then we'll have short presentations on the habitat program and EDT updates. All are welcome to join us tomorrow morning.
- Kirk T. – Thanks to all staff for your contributions to the data collection and presentations. In future APRs, we should be able to have discussions about changing how the program operates based on data collected over the years. Please take a look at the information packet provided and feel free to share with others. All input on the program is welcome. That is one of the purposes of the APR.
- Todd P. -- We had talked about doing egg boxes for SUC in the past. Any update on that?
- Matt L. - We did install egg boxes in the San Poil with hatchery eggs to flesh out methods only. We haven't transitioned to the mainstem Okanogan yet. Recovery is going to be difficult, but we're still pursuing that project

END DAY 1

2021 CJHP APR Meeting Summary

Day 2

Wednesday March 31, 2021

11th Annual
2021 APR Meeting Summary
Day 2- March 31, 2021
DRAFT

Day 2 - Wednesday, March 31

Attendees: See attached attendance list

Part 5 – Future Program Management and Annual Work Plan for 2022/2023

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

9:15 – 10:00 **Future Program Management (2021 and Beyond).**

- *ISIT Updates – Key Assumptions, 2021 Management Targets*

- Casey B. – Can we operate the ladder more aggressively and limit the number of segregated HORs that make it to the spawning grounds? How much freeboard do we have with steelhead take?
- Kirk Truscott – This is worth looking at. We have always had a bit of wiggle room. The difficulty is the steelhead take is tracked based on brood year, so it includes take associated with the summer/fall fishery, brood collection, ladder operations, etc. in 2020 plus spring Chinook brood collection in 2021. We don't want to be too aggressive during s/f brood collection and preclude spring Chinook activities the following year**.**
- Casey B. **–** This is an awkward way to manage things. Can we shift take into kelt take? Can we shuffle the deck with NOAA on steelhead accounting so it is based on annual activities? It would make decision making at the ladder and elsewhere much easier. We could work on this with Chuck Brushwood and put together a letter outlining management options.
- Kirk T. – It would be worth having the discussion with NOAA. The TRMP didn't distinguish between takes of fresh fish vs. kelts. The other consideration is that even though we encounter more steelhead during ladder operations than any other activity, the post-release mortality is only 1%, so we can handle a lot of steelhead before we reach high mortality rates.
- Steve Smith – Early on, when limits were set for steelhead, I recall they were very restrictive for CCT relative to other programs on the Columbia River. You may want to ask NOAA to provide information on limits assigned to other programs.
- Kirk T. – Sure, we can do this. The other thing to work on is we are not very aggressive with surplusing early in the season then we end up with a group of fish in the vicinity of the ladder later in the year in Sept/early Oct and people aren't interested in consuming those fish. What else can we do with those fish? Nutrient analogs, find a buyer? Giving them

away would be better than hauling them to the landfill and paying to dump.

- Casey B. – Ultimately, in the long run, we would like to put these fish in Rufus Woods to spawn, but this is not an option now.
- Steve S. – I've heard that BPA will not allow CJH program fish to be introduced above CJD. The PUD has some fish authorized – could they share their portion?
- Kirk T. – We're still discussing options with BPA. Neither party has changed their position to date. Can we take a retrospective look at surplusing efforts and see if there is an impact in CPUE in the weeks following the surplusing event? Is there a cause/effect relationship? Is fishing better if we leave fish in the river? We've assumed there is an adverse effect to fishing if we run the ladder, but this may not be the case.
- Casey B. – The idea was, the less we run the ladder, the more fish are available for harvest, but we haven't verified this. Leaving too many fish in the river increases the risk that more segregated HORs will go to the spawning grounds.
- Joe Peone – I would prioritize filling the freezers and lockers. Can we invite other tribes in to share surplus fish?
- Kirk T. – There has been sharing in the past. Maybe other tribes would be ok with taking later, lesser quality fish – this is better than no fish. Sharing needs to be approved by Council. Back to the fishery, fishing in the tailrace is more of a visual, targeted fishery. Not sure that density of fish matters like with trolling/ rec fisheries.
- Brian Dietz – In the past, when we run the ladder, we see a drop-off in the creel for about a day. In the snag fishery, CWT data shows us that harvested fish are often from other programs. You have segregated HORs and other hatchery fish milling around the base of the dam. There are still angler opportunities if we do surplus these fish. The flesh content drops significantly after about the beginning of September. That's when we usually start taking fish to the dump or sorting fish out that look pretty bad.
- Kirk T. – We could consider surplusing in July/first half of August. If the data shows there is still a lot of fish, we could get really aggressive later in the month.
- Steve S. – I heard Casey's presentation yesterday about underharvesting of HORs. Early on, the plan was to look into using floating fish traps between the dam and the mouth of the Okanogan. We ended up scaling them down to a smaller size (initial designs were large). It's a fishing opportunity for individual tribal members, and is an opportunity for catching fish either for harvest or transplanting above the dam. They are live captured and easier than the Dream Catcher. Is now the time to put that capture capacity back in the Okanogan? I can help with this if needed.
- Kirk T. – I have the same recollection. Permitting and installation were very expensive -- dropping anchors, driving pile, etc. Environmental conditions at the dam are difficult with swings in tailwater conditions that make it difficult to build a scaffold that is the right height and maximizes the efficacy of gear. We are working with USACE to improve fishing access opportunities at the tailrace.
- Steve S. – WDFW is trying to open trapping as a legitimate fishing option. This may be an option with a smaller trap that can be disassembled and moved, and used in the lower river in spring, upper river in summer, and lower river in fall. This seems like an opportunity there.
- Joe P. – What fisheries are allowed at the tailrace?

- Kirk T. – 100m upstream of the ladder to the Hwy 17 bridge is selective harvesting only – hook-and-line and dip netting, but no snagging or spearing.
- Joe P. – Is the preference to put surplus fish in the blocked area above Grand Coulee?
- Kirk T. – That would be ideal.
- Joe P. – Some resource managers downstream may be nervous if we start talking about fall production.
- Kirk T. – As far upriver as we are, we don't expect to see bright upriver fall Chinook. We have seen Priest Rapids fish in late fall in the ladder, but they are not in great shape when they get here.
- Casey B. – We've seen video evidence of bright fish at the ladder, but they are few and far between. The majority of Hanford or Priest Rapids fish don't look good when they get here.
- Steve S. – Any fall run fish have to make it through an intense fishery in Zones 1-6.
- Rich Bussenich – Air drying/jerky is the best use of lower quality fish. If not doing this already, this could be a great education campaign.
- Joe P. – We have several tribal fishers who sun dry their sockeye; I haven't seen this with Chinook. Is BPA aware we have these late surplus fish available for reintroduction efforts above the dams?
- Kirk T. – BPA is well aware we have these surplus fish, and that we have built strategies around the use of these fish for reintroduction efforts, but their legal interpretation of the congressional intent of the hatchery is very strict.
- Casey B. – To wrap up, Kirk, Chuck and I will work on a letter to NOAA about reauthorizing the timing of take – restricting kelt take to annual rather than brood year take. We should consider a more aggressive ladder operation plan in July and August to use fish in better shape, and then look at the steelhead take issue to see if we can operate the ladder once or twice in the fall to see if we can get remaining fish out of the river.
- Joe P. – If we can work with council to see if we can smoke these fish up, last year the tribe sold them for $10/fish and they disappeared within a week (these were RBTs from the trout hatchery).
- Casey B. – Late Aug early Sept Chinook are still good for smoking. Later they are not.
- Kirk T. – BPA is not opposed to us using surplus fish for nutrient enhancement in the blocked area, preparing these areas for reintroduction (after doing proper disease screening). This would benefit resident fish for now and anadromous fish after passage facilities are installed.
- John A. – We also have needs for nutrient enhancement in the Okanogan. Thank you for suggesting changing language about kelt take at CJ Hatchery. I'd like to stay in the loop. Can we utilize those kelts in a reconditioning effort?
- Rich B. – ONA would also be interested in exploring using carcasses for outplants in Canada portion of the Okanogan.
- Casey B. – I'll add this to the list to coordinate with the habitat program at OK and ONA. If carcasses are available in Sept/Oct, who wants them and where should they be allocated – anadromous zone in US or Canada, or to blocked area?
- Steve S. – chat - By leaving fish in the river, are you getting more mainstem spawning? Anyone looking?
- Matt L – chat - Aerial surveys occur throughout October. Only 1 redd was detected

last year. We know that there is undetected spawning though, as we are able to catch mainstem-spawned juveniles (determined using SIA analysis) during beach seine efforts in June.

- Andrea P. – chat - We would need to conduct underwater video surveys in the mainstem to detect redds deeper in the Columbia, similar to what WDFW did for the acoustic study.
- Steve S. – Chat – A few years back, USGS was going to bring the Snake River cameras over to scan the river below CJD. I think it was Billy Conner.
- Matt L – chat - Do you recall which office he's out of?
- Steve S. – chat - I associate his name with USFWS (now USGS?) and I thought he worked out of Dworshak. He researched the fall Chinook population
- Casey B. – Based on the run forecast, we should be able to collect 100% NOR brood for the integrated program and 100% int HORs for the segregated program.
- Todd P. – Do we want to talk about fecundity assumptions now? There was a discussion yesterday about using actual 5-year average fecundity vs. previous program assumption.
- Andrea P. – This has come up the past few years. We are at the point where it is clear we are not meeting the fecundity assumption. We need to make a decision for future planning.
- Todd P. – I know there are concerns about space to hold additional brood. What is the capability to do late trap spawning to address the space issue? We do some of this at Priest Rapids and it has worked.
- Casey B. – That fits into the discussion we just had about fish at the ladder in October. The question is why wouldn't we just start the ladder and grab X number of fish to have the right number of eggs to make up for the fecundity shortfall. I think we tried that or looked at it a few years ago.
- Matt M. – This hasn't happened since I've been here, but I'm open to trying this. We could replace what we spawn. It's an option.
- Kirk T. – Once we're done with the springer spawn, we could use those two adult ponds to increase our holding capacity for summer Chinook. We didn't do it in the past so we didn't increase our handling effect.
- Matt M. – Springer ponds are empty after the first week of September and could be used after they are cleaned.
- Kirk T. – There is a strategy there to increase capacity with existing infrastructure if we collect additional brood fish. We handled and released 600 NORs last year at the weir, so we could collect additional brood, increase NOR extraction at the weir.
- Casey B. – At the ladder, it would be primarily segregated fish.
- Kirk T. – The timing of collecting at the weir would be about the same as the timing for freeing of the springer ponds.
- Matt M. – We spawn either 3 or 4 weeks, so basically after Labor Day they are available.
- John Rohrback – We have beach seined at the Klein Site on the Similkameen in the past, as well. This takes more work than picking fish up at the ladder or the weir, but it can help to reduce pHOS in the reach with the highest pHOS of all (the Similkameen), and gets broodstock from a source that minimizes the risk of including strays.

- Andrea P. – The Klein site would be the last option if we couldn't get them at the weir or ladder.
- John R. – The timing works out for this, too - you wouldn't be pulling summers off of redds in the month of September.
- Casey B. – assuming we can put additional fish needed for the integrated program in one pond, and the fish needed for segregated program in the other pond, we may have to wait until spawning starts for summers, then run ladder to get those segregated brood.
- Jeannie Heltzel – If we adjust the fecundity assumption to reflect the 5-year average, it's about 100 additional brood required for each program – 50 females and 50 males for each program.
- Matt M. – Each raceway can hold 100 fish easy.
- Kirk T. – That doesn't increase our water demand in the middle of August?
- Matt M. – We wouldn't need a full water demand for those raceways with only 100 fish each.
- Casey B. – It makes sense to get whatever HOB from the weir, and if we are short, then get them from the ladder. It's more consistent with the objectives of each program if we are using integrated hatchery fish for the segregated program.
- Kirk T. – This is fine, especially if we also run the ladder more to reduce the number of seg HORs on the spawning grounds. This biological impact of these fish is limited. So, if some seg HORs are used for brood, it will have a negligible impact on the spawning population.
- Andrea P. – Agree.

    - *Harvest and Hatchery programs (Steve Smith)*

- Kirk T. – How are harvest targets calculated?
- Jeannie H.– The harvest rate assumptions used to calculate the Management Targets are based on what has happened in the past (5-year average harvest rate), not on what we want to happen.
- Kirk T. – We need to change assumptions for harvest.
- Casey B. – With the original program planning assumptions, we assumed segregated HORs would be harvested rather than return to CJH.
- Jeannie H. – In 2019, we had such a low return forecast, we adjusted harvest targets lower to allow more fish to reach the spawning grounds. In 2020, we expected low returns based on the preseason TAC forecast.
- Steve S. – We have run out of time, so I'll send a memo about harvest. Isaiah sent me an updated harvest number, so I'll update memo with those numbers and get them out the next few days.

    - *RM&E program – update on PIT arrays (John Arterburn)*

- John A. – I would like to discuss adding a new PIT tag array. We reviewed spring Chinook tagged at Priest Rapids, and found there is value in a mainstem array to redetect any fish

that go into the tributaries temporarily, then back out and spawn elsewhere. A mainstem array could detect fish and attribute them to mainstem spawning. It's important for spawning estimates. We started working on a proposal but then Covid hit, so it has not moved forward. Any suggestions?

- Andrea P. – One of the ideas last year was looking at the location of the array. It is important to move forward with this proposal, and discuss the location and benefits of improved detection to Chinook and other species.
- John A. – We have done some field observations to narrow down specific sites (below Johnson Creek, between Johnson and Tonasket), but have not made any decisions. We'll collaborate with Andrea on this. We will have to make that decision before we get too far on the proposal.
- Kirk T. – Haven't we also discussed an array in the Similkameen?
- John A. – We haven't put much effort into that because the substrate is all sand and there is nothing to anchor to. You could put it further up in the Similkameen, but then you are above the spawning area. It's a problematic location. I'm not sure it answers the questions we want to answer.
- Kirk T. – Of springer carcasses recovered in the US, they were predominantly recovered in the Similkameen. What is the timing? Is it a biological sink?
- John A – A PIT array in Similkameen wouldn't tell you much.
- Matt L. – It's a black box. They are either not getting detected or not making it through. We wouldn't expect much spawning below (blindsight) and it's all gravel.
- John A. – The substrate would only hold something upstream of Oroville. Most data suggest fish use of tributaries comes from below Johnson Creek. If we have a mainstem array above that point, we can tell if they dip in for cold water, but then return to the mainstem. We can't find the redds, but PIT estimate says there are fish there. Are they staying in the tributaries or moving back to the mainstem after it cools off?
- Matt L. – Would it be easier to answer these questions by improving arrays in Omak and Salmon Creek?
- John A. – We already have ability to do directionality in those locations, Johnson Creek is the only location that doesn't have this ability. Logistically, two arrays for directionality doesn't always work out because often only one array picks up fish. Another mainstem array helps figure out if they are entering, leaving, and entering tributaries again.
- Matt L. – We could spend some more time looking at existing data, timing and number of detections at different locations, and individual tag histories.
- John A. – This would definitely be worthwhile. A new array is expensive.
- John A. – We will have updated EDT estimates in 2022 for summer/fall Chinook. Plan on receiving an update in 2022.
- Matt L. – Does this incorporate the last 5-10 years of data for the mainstem?
- John A. – Yes, for summer/fall Chinook.
- Todd P. – What are 2021 plans for juvenile monitoring as far as using screw traps, egg boxes.
- Andrea P. – This is included in the work plan discussion later today. We did a pilot egg to fry study in the Okanogan Basin. The plan for 2021 is to look at the feasibility of doing a

study in coordination with OBMEP. This is in the next contract cycle. Flow conditions make it difficult to extract egg boxes. Covid pushed plans forward one year, but we are still discussing this.

- Todd P. – Will screw trapping be conducted this year while pilot study on egg boxes takes place?
- Andrea P. –Yes, the plan this year is to use the screw trap as well as continue beach seining in mainstem in May.
- Kirk T. – This is just a pilot study at this point.
- Andrea P. – Yes, the proposal would go to our funding partners for inclusion in the next funding cycle (2022-23).

10:00 – 10:30 Future Program Management (2021 and Beyond) (continued). *CCT*

Habitat – update on 2021-2022 projects (Chris Fisher, John Rohrback, CCT)

Chris F. presentation --

- Joe P. – Is there evidence of spawning by Salmon Creek already?
- Chris F. – Downstream of the Highway 20 bridge there is some activity. Based on 2010, we are going to extend the current spawning area up to this site, but I don't know how long they will be effective. I'm hopeful they will be used for years if not decades. There is some spawning just downstream of here.
- John A – Spawning distributions in the OK river coincide with areas where you have some gradient, it seems to be the limiting factor. Fortunately, through this reach there is sufficient gradient to keep gravel clean and provide additional spawning areas. I'm a little concerned about how engineered these are. Why wouldn't you just allocate gravel and let the river redistribute in a natural manner?
- Chris F. – The Okanogan River is very low gradient. If we put material in the main channel, the first high flow it is likely to mobilize and be moved downstream after one spawning season is over. We know we have velocities and depths conducive to summer Chinook, but not the right substrate conditions. It's built right on channel margin, so we will have velocities for spawning, but not enough to wash material away.
- Kirk T. – What have we learned about artificial spawning substrates constructed in Penticton Channel? Those flows are more restricted. My understanding is those substrates have been occupied by Sockeye and Chinook.
- Chris F. – Yes, those areas have been used for years, but flow is highly regulated and is about 30% of flows in the lower Okanogan. But those spawning platforms are well utilized and have been for years. In that environment, this is the only option to provide spawning habitat. In the Okanogan, these spawning ridges can be built relatively inexpensively and create some variability in reaches with no spawning activity.
- Kirk T. – My concern is the longevity of the feature. Fish will probably use it as long as it's there.
- Chris F. – If this works, it can be built relatively inexpensively in areas where we have depth and velocity.
- Matt L - For context on Chris's construction project, the above jpg (sent in Chat) shows redd locations above and below the mouth of Salmon Creek (2013 to 2019). Note the

absence of redds within 1 mile above or below Salmon Creek.
John R. presentation --

- Joe P. – Does the Tribe own the Klein site?
- John R. – No, it is owned by BLM.
- John A – I see you just dug stuff out and there is no wood at the opening. What is going to maintain the opening without the wood?
- John R – Elevation and rock hardening. Farr Road channel has wood at opening, but it slows down flow and contributes to sediment fall out at the upstream end of opening, contributes to elevating activation flows and changes time fish can access. Sediment is an issue at Similkameen, so absent the wood structure we are hoping to maintain accessibility as long as possible.
- Chris F. – NRCS model looked at 2,008 tons per year production, so anytime you create channels that have less energy in the channel, you want to keep suspended material suspended. Anytime you add roughness sediment settles. It is unlikely you would have rearing for any length of time. Hopefully fish will get in, get big, and get out.
- Casey B. – What is the risk of stranding as channels dry up?
- John R. – We have some backwater, but there is flow in the lower reaches at lower elevations. We are maintaining flows even at lower Similkameen elevations.
- Chris F. – There is a trade-off -- are you going to die by stranding or by staying in it too long? They really need to exit the system. If you don't get out by July, you're not going to get out.
- Joe P. – Will you be monitoring that info?
- Chris F. – We want to avoid creating habitat for undesirables – centrarchids, SMB, etc. Later in spring by early June there are SMB in other created features. To minimize production of nonnatives, we wanted to keep these side channels activated for summer Chinook, but not available for other warm water species.
- Kirk T. – I'm assuming this will provide another opportunity to coordinate with this habitat effort and CJ hatchery juvenile tagging effort? Would help to measure positive benefits of getting big and getting out.
- Andrea P. – Yes, it would supplement efforts at Farr Road. We will still sample at Conservancy Island if we can get access.

10:30 – 10:40 **Break**

10:40 – 11:40 **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

11:40 – 12:10 ***Lunch***

12:10 – 1:50 **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

1:50- 2:00 **Wrap up, Actions and Next Steps.** *Casey Baldwin, Andrea Pearl, CCT; MEI*

END 2021 APR

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Updated: March 22, 2022

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The Chief Joseph Hatchery
2022 Annual Program Review

Grant County PUBLIC UTILITY DISTRICT

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DOUGLAS COUNTY PUD