

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

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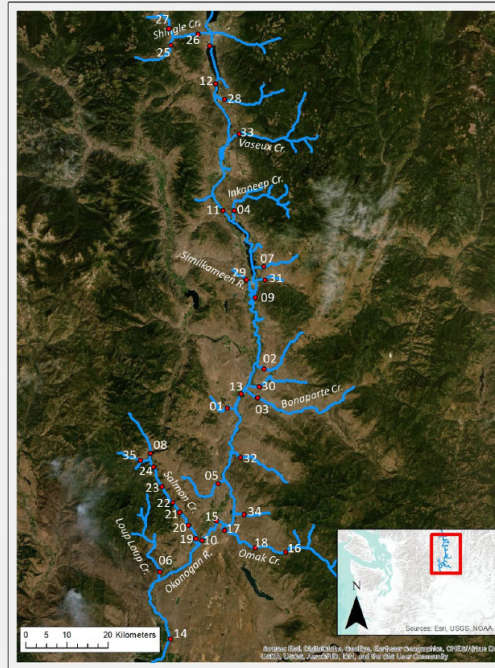
Current monitoring efforts

1. **Environmental DNA (eDNA) monitoring**
 - a) Spatial distribution (adults)
 - b) Confirm successful spawning (juveniles)
 - c) Occupancy model to assess status and trends in occupancy (and detection probability)
2. **Visual redd & carcass surveys**
 - a) Extent of spawning
 - b) Carcass recoveries
3. **Juvenile mark-recapture (OBMEP electro-fishing)**
 - a) Confirm successful spawning
 - b) Juvenile population estimates
 - c) Genetic analyses
4. **Adult PIT tags (+ WDFW Video at Wells)**
 - a) Adult run estimate
 - b) Run composition
 - c) Adult spatial distribution

eDNA Monitoring

eDNA Monitoring Overview

- Early detection, especially those tributaries that receive little visual survey effort
- 27 sites in tributaries
- 8 sites in mainstem Okanogan
- Adding 8 sites in Lake Okanogan tributaries in fall 2021 (more on this later)



eDNA-based spatial distribution monitoring

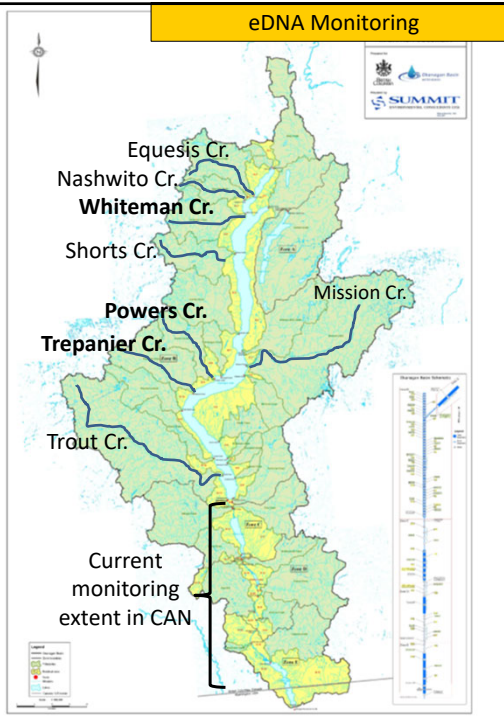
eDNA Monitoring

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															
Inkaneeep Creek	-	+		-		-	-	-							x
Shattford Creek											+				x
Shingle Creek (Lower)	-	+		+		-	+	-							x
Shingle Creek (Upper)															x
Shuttleworth Creek	-	-		-											x
Vaseux Creek	-	+		+		+	+	-							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

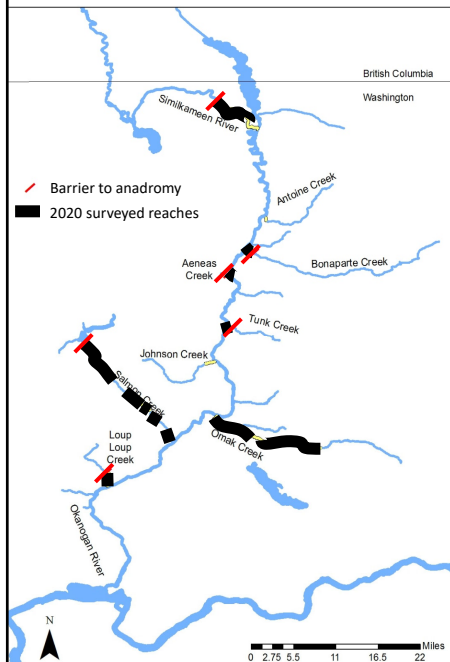
Lake Okanagan Habitat

- Whiteman Creek – 1 spring-Chinook observed in Sept 2020
- Powers Creek – 1 spring-Chinook carcass collected in 2020
- Trepanier Creek – 1 spring-Chinook observed in 2020



Visual redd & carcass surveys

Visual survey effort for redds and carcasses



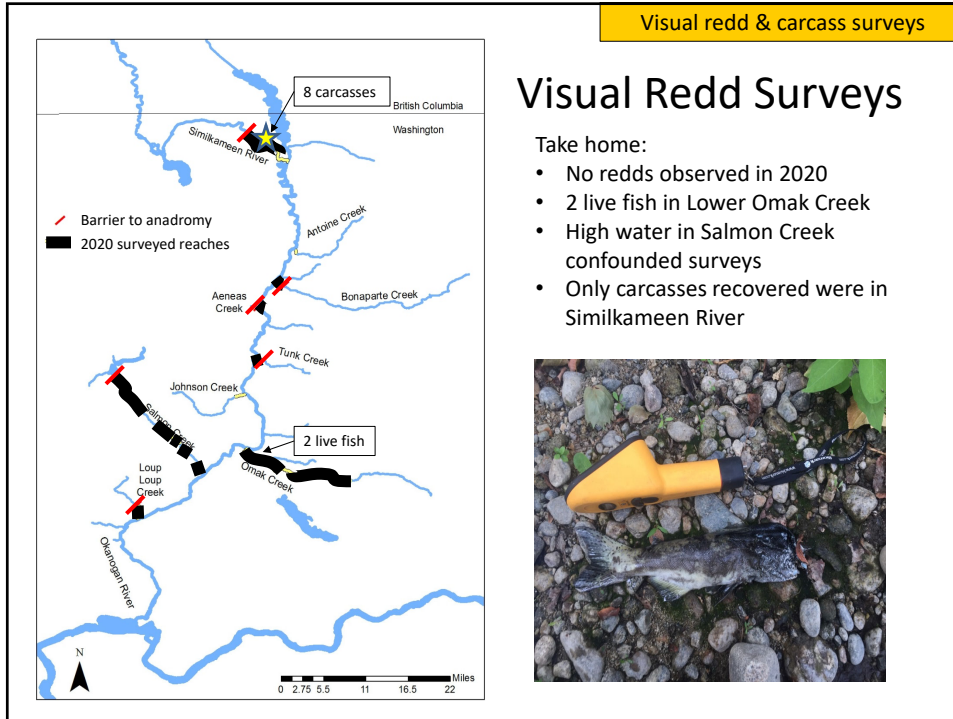
Stream	Number of surveys	2020 Date(s)
Aeneas Creek	1	Oct 1
Bonaparte Creek	1	Oct 1
Loup Loup Creek	3	Aug 20 – Sep 22
Omak Creek (lower)	6	Aug 14 – Sep 24
Omak Creek (upper)	2	Aug 24
Salmon Creek (lower)	3	Aug 31 – Sep 21
Salmon Creek (upper)	3	Aug 27
Similkameen Canyon	4	Aug 14 – Sep 22
Tunk Creek	1	Sep 21

Visual redd & carcass surveys

Visual Redd Surveys

Take home:

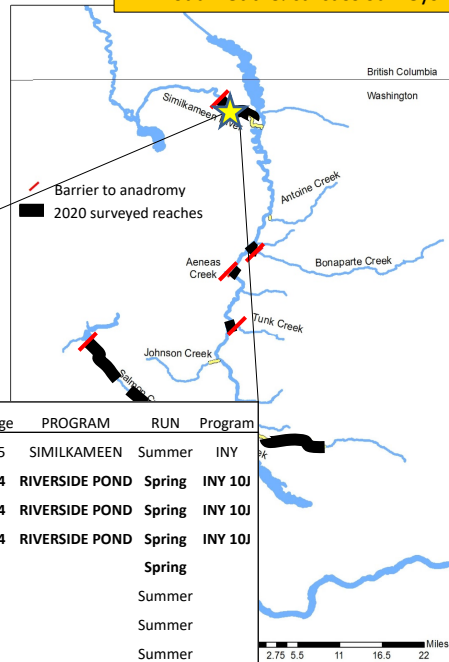
- No redds observed in 2020
- 2 live fish in Lower Omak Creek
- High water in Salmon Creek confounded surveys
- Only carcasses recovered were in Similkameen River



Carcass recoveries

- Collected 8 carcasses during pre-spawn floats in Similkameen Canyon (S2)
- Between Aug 14 to September 22, 2020

Visual redd & carcass surveys



Cap. Date	Adipose	CWT#	Brood Year	Hatchery of Origin	Age	PROGRAM	RUN	Program
8/14/2020	Clipped	200127	2015	SIMILKAMEEN HATCHERY	5	SIMILKAMEEN	Summer	INY
8/21/2020	Clipped	200135	2016	CHIEF JOSEPH HATCHERY	4	RIVERSIDE POND	Spring	INY 10J
8/21/2020	Clipped	200135	2016	CHIEF JOSEPH HATCHERY	4	RIVERSIDE POND	Spring	INY 10J
8/28/2020	Clipped	200135	2016	CHIEF JOSEPH HATCHERY	4	RIVERSIDE POND	Spring	INY 10J
8/28/2020	Present	NO TAG					Spring	
8/28/2020	Present	NO TAG					Summer	
9/22/2020	Present	NO TAG					Summer	
9/22/2020	Clipped	NO TAG					Summer	

OBMEP Tributary Surveys

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



OBMEP Tributary Surveys



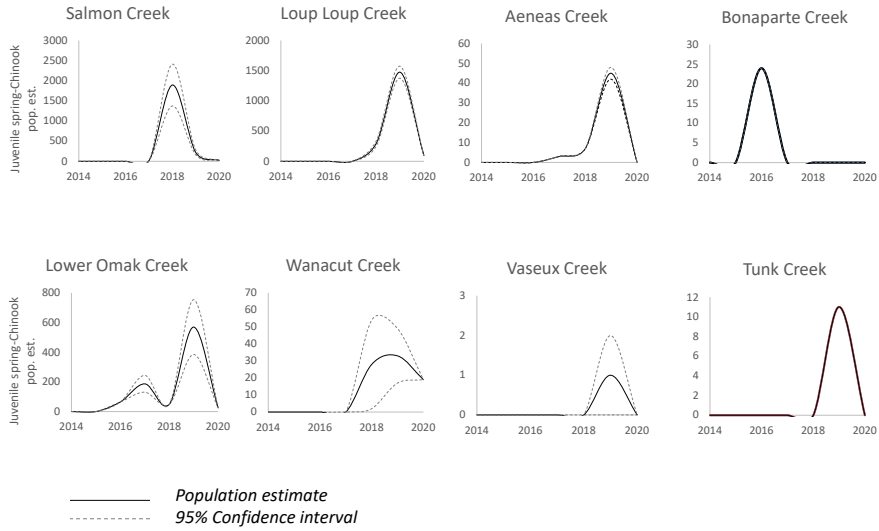
2020 Juvenile Spring-Chinook

(Fork length range: 68 - 132mm)

- Lower Omak Creek 2 captures (9/21)
- Wanacut Creek 2 captures (9/23)
- Loup Loup Creek 13 captures (9/30 – 10/1)
- Salmon Creek 1 capture (10/6)

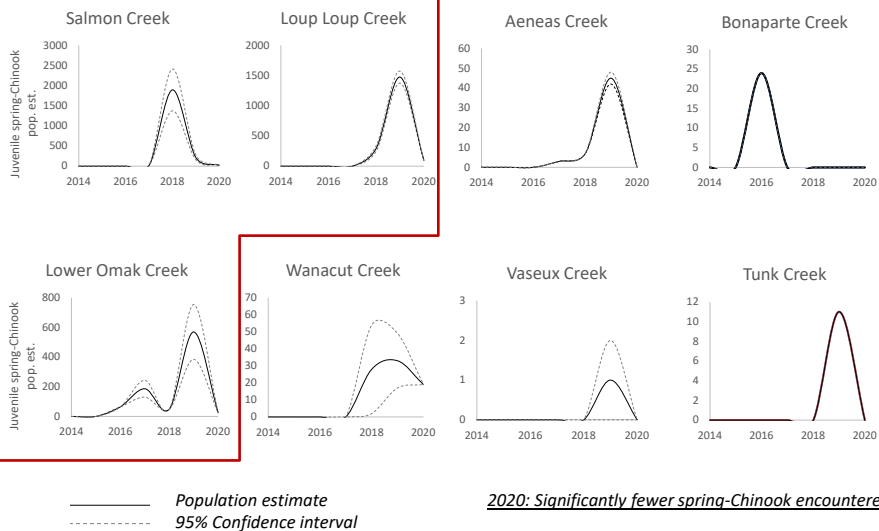
Juvenile mark-recapture (OBMEP electro-fishing)

OBMEP Tributary population estimates



Juvenile mark-recapture (OBMEP electro-fishing)

OBMEP Tributary population estimates



2018 Genetic analyses Juvenile Chinook, n = 92

92 juvenile fin clips collected in fall 2018 during OBMEP electro-fishing efforts

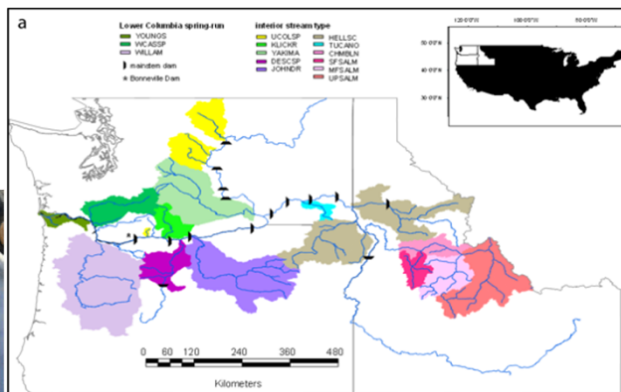
Genetic analyses conducted by
CRITFC (Hagerman, Idaho)

1. Genetic stock identification, or GSI
2. Parental-based tagging, or PBT
3. Siblingship assignments



Genetic stock identification (GSI)

- 71 samples assigned as Upper-Columbia spring-Chinook
- 1 sample assigned as Upper-Columbia summer/fall-Chinook
- 1 sample assigned as John Day River
- 21 samples failed to assign



Parental-based tagging, or PBT

- No fish could be assigned with PBT - all fish are putatively natural-origin

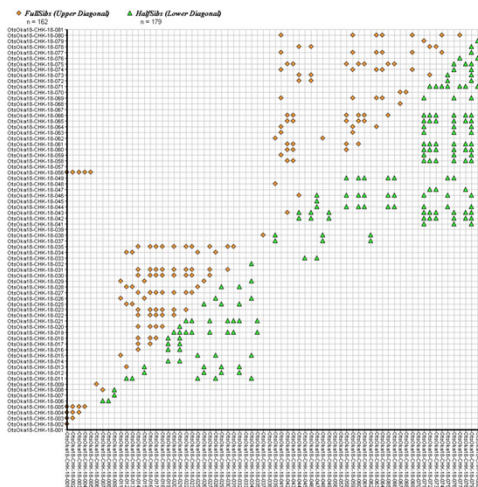


PBT tag rates

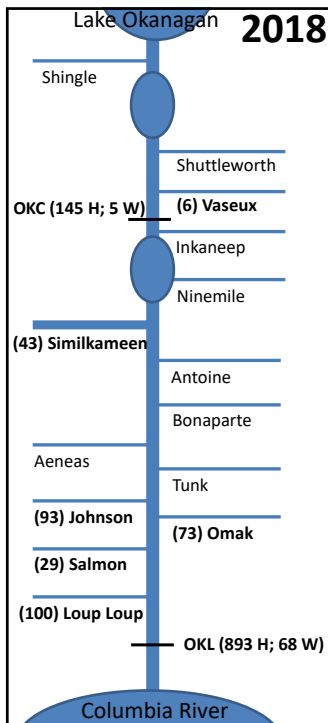
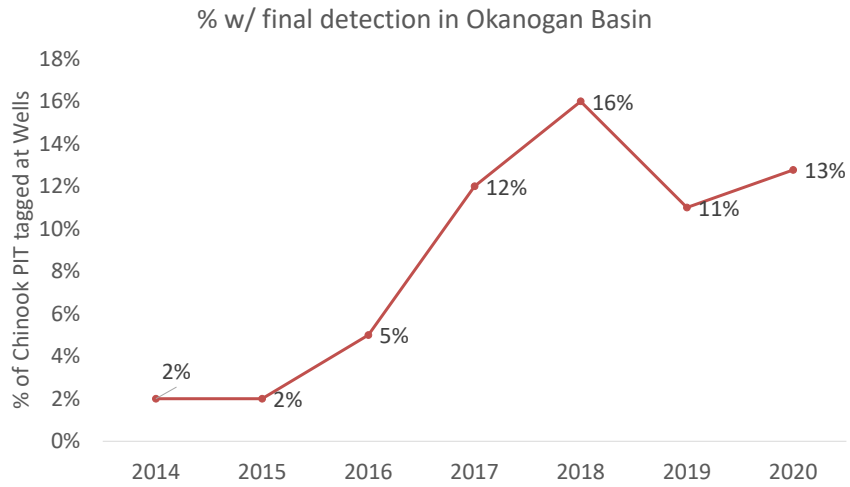
Hatchery Name	2013	2014	2015	2016	2017
Chief Joseph Hatchery (Spring)		0.89	1.00	0.98	0.93
Chief Joseph Hatchery (Summer/Fall) - Integrated	0.70	0.89	0.90	0.99	0.77
Chief Joseph Hatchery (Summer/Fall) - Segregated	0.89	0.44	0.96	0.99	0.92

Siblingship assignments

- Sibship reconstruction analysis estimated that the samples we sent them (n = 71) represents approximately 20 spawners (12 – 38; 95% CI)
- Highly related, from small number of spawners
- 23 unique families with 1-11 full sibling members



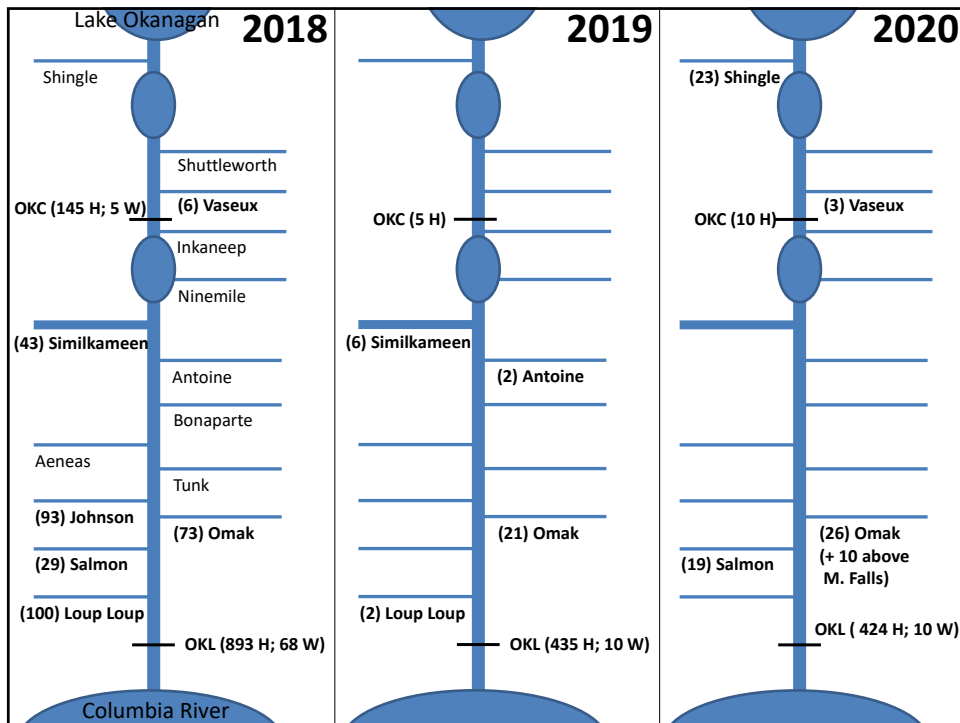
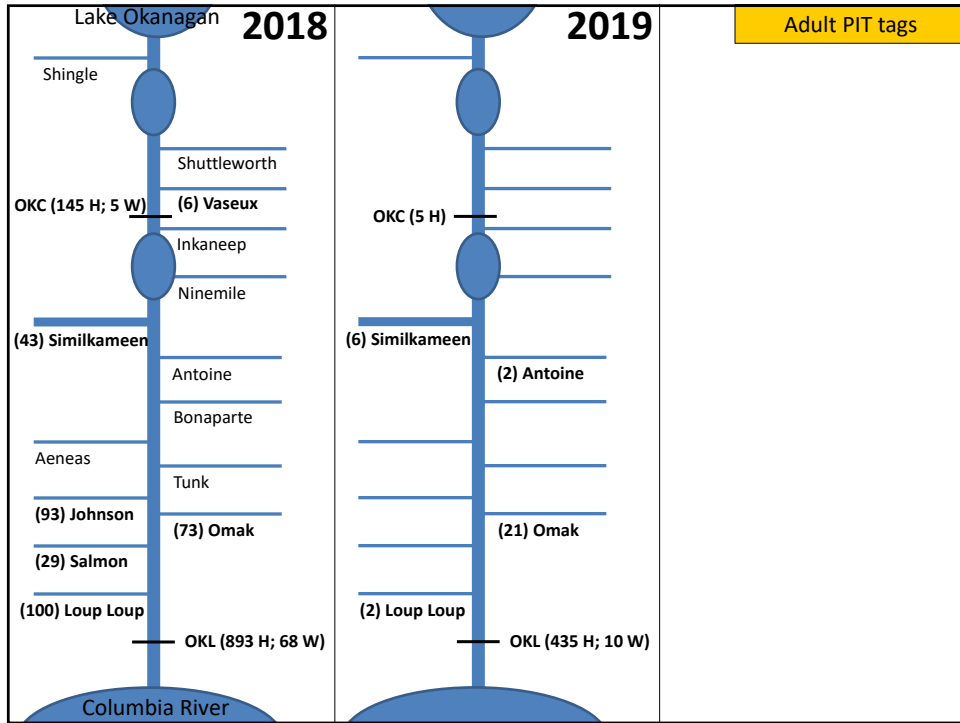
Okanogan River spring Chinook PIT tagged at Wells Dam



Adult spring-Chinook returns to tributaries (last detections)

← Conceptual diagram of Okanogan Basin

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



WDFW Spring Chinook Okanogan Run Estimate (includes returns to CJH)

Based on Wells video & PIT detections

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

Note: 2020 Hatchery Origin values comprised of

- 706 10j (Riverside acclimation pond)
- 886 CJH segregated

Comparison of 2020 In-season, end-of-season, and WDFW/Wells spring-Chinook run estimates

Program	In-season estimate	End-of-season estimate to Wells	WDFW run estimate
CJH Segregated	283	112	706
Okanogan 10j/Riverside	687	851	886
Combined	970	963	1592