

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

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Current monitoring efforts

1. **PRD Run Escapement**
 - a) Run estimate
 - b) Run composition
 - c) Adult spatial distribution
1. **Environmental DNA (eDNA) monitoring**
 - a) Spatial distribution (adults)
 - b) Confirm successful spawning (juveniles)
2. **Visual Surveys (redd & carcass)**
 - a) Redd counts (spatial extent)
 - b) Carcass recoveries
3. **Juvenile mark-recapture (OBMEP electro-fishing)**
 - a) Confirm successful spawning
 - b) Juvenile population estimates
 - c) Genetic analyses

2022 Run Estimate to Okanogan

PIT tags

Okanogan Run Estimate (Provided by WDFW)¹

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

¹Based on PIT tags from Priest Rapids tagging effort

Trends

Spring-Chinook Okanogan Run Estimate (provided by WDFW)

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

Year	Hatchery Origin	Natural Origin	Unknown Origin	Run Estimate
2014	0	0	186	186
2015	0	0	204	204
2016	0	0	240	240
2017	0	0	653	653
2018	1401	73	0	1474
2019	518	14	0	532
2020	1592	55	0	1647
2021	2612	272	0	2884
2022¹	358	27	0	385

¹Note: 2022 Hatchery Origin values comprised of

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

Does not include returns to CJH

2022 Run Estimate to Okanogan

PIT tags

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

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

2022 Run Estimate to Okanogan

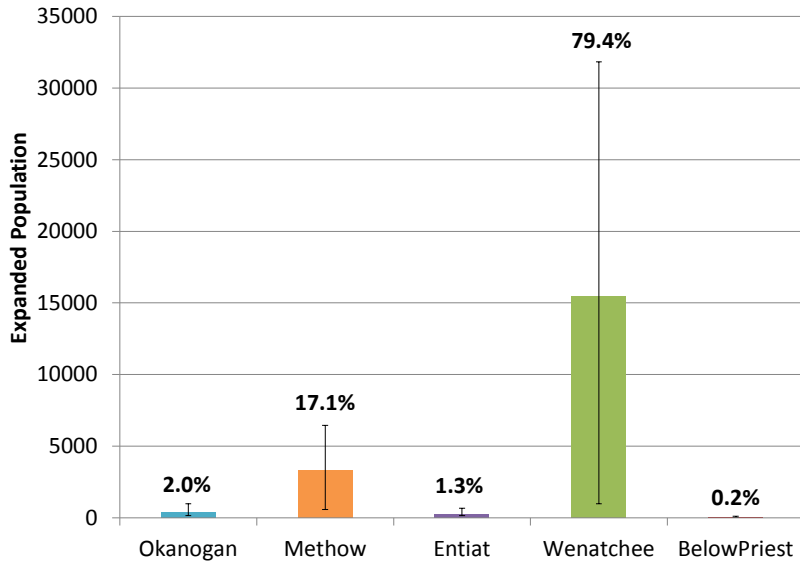
PIT tags

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

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

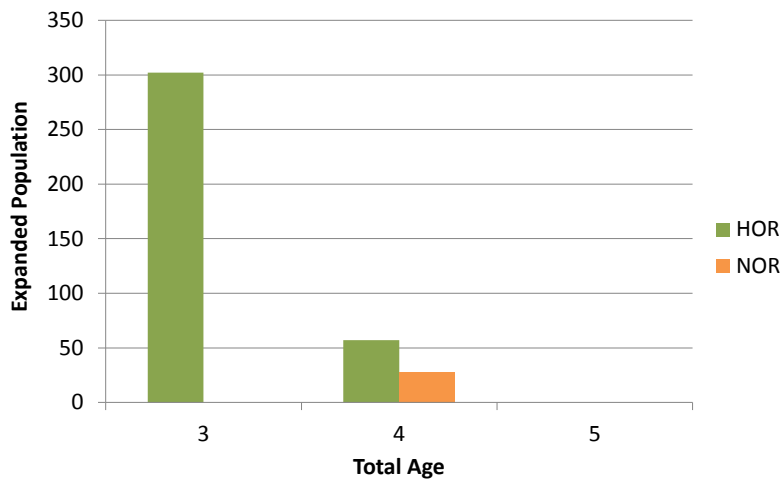
Adult PIT tagging

PRD Run Escapement Estimates



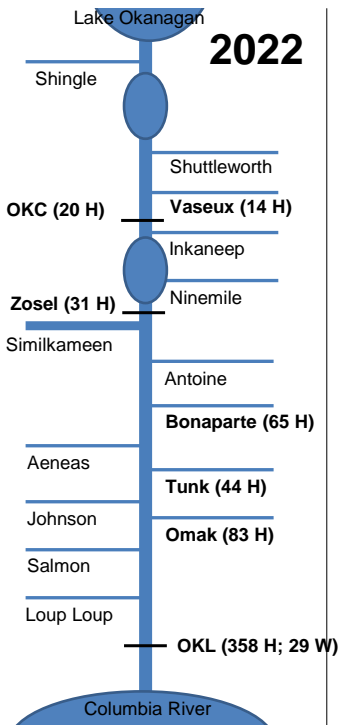
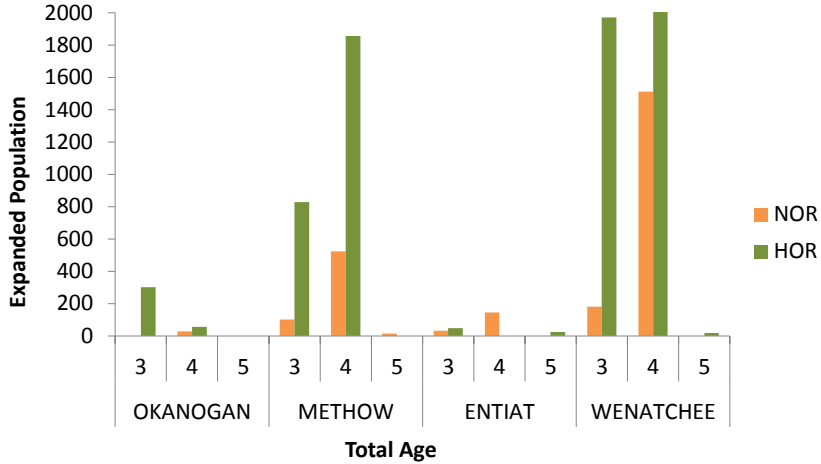
PIT tags

Okanogan Spring Chinook Age Structure



PIT tags

Upper Columbia Spring Chinook Age Structure



Adult PIT tags

Adult spring-Chinook returns to tributaries (last detections)

- ← Conceptual diagram of Okanogan Basin
- (n) indicates estimated adult spring-Chinook based on PIT expansions (for WDFW PRD tag group)
- Mostly 10j returns, with a few wild returns

eDNA – Evidence of successful reproduction

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

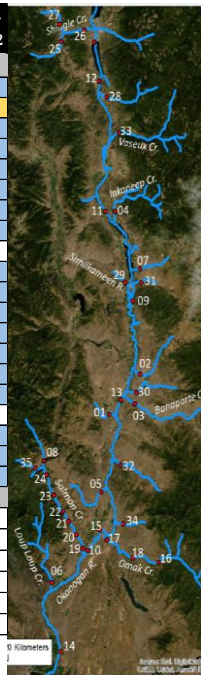
eDNA Monitoring



Chinook eDNA –U.S. and Canada Tribs

eDNA Monitoring

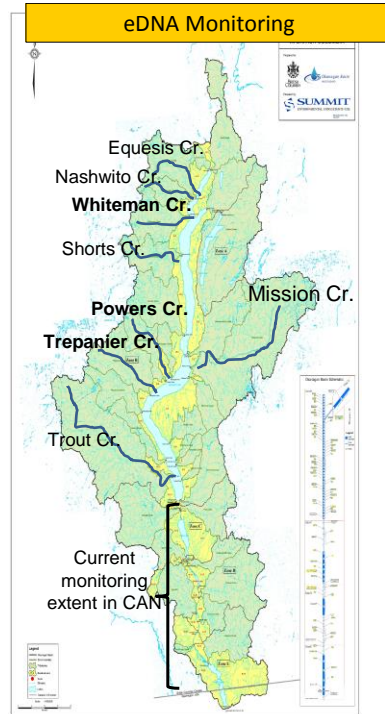
Site	Jun 2012	Aug 2012	Oct 2013	Sep 2014	Sep 2015	Sep 2016	Sep 2017	Mar 2018	Sep 2018	Mar 2019	Sep 2019	Sep 2020	Mar 2021	Sep 2021	Mar 2022
US Tributaries															
Aeneas Creek (1)			-	-		-	+	-	-	-	-	+	-	-	-
Antoine Creek (2)			-	+		+	-	-	+	-	+	-	-	-	+
Bonaparte Creek (3)	-	+		-		-	+	-	+	-	-	-	-	-	-
Johnson Creek (5)						-	-	-	-	-	-	-	-	-	-
Loup Loup Creek (6)			-	+		+	+	-	+	+	+				
Ninemile Creek (7)	-	-		-		+			-	-	-	-	-	-	-
Omak Creek (near mouth) (17)	+	+		+		+	+	-	+	-	+	-	-	-	-
Omak Creek (above falls) (16)	-	-				+	+	-	+	-	-	-	-	-	-
Omak Creek (Haily Creek Washout) (37)														+	
Omak Creek (Mission bridge) (18)											-	-	-	-	-
Salmon Creek (RKM 0.6) (19)											-	-	-	-	-
Salmon Creek (RKM 2.9) (20)											-	-	-	-	-
Salmon Creek (RKM 7.1) (21)	+	+		+		+	+	-	+	+	+	-	-	-	-
Salmon Creek (RKM 17.3) (22)											+	-	-	-	-
Salmon Creek (RKM 21.9) (23)											-	-	-	-	-
Salmon Creek (RKM 25.5) (24)											-	-	-	-	-
Siwash Creek (30)				+							-	-	-	-	-
Tonasket Creek (31)				+		-	-	-	-	-	-	-	-	-	-
Tunk Creek (32)				-		+	+	-	+	-	+	-	-	-	-
Wanacut Creek (34)				-		-	+	-	-	-	-	-	-	-	-
Canada Tributaries															
Inkaneeep Creek (4)	-	+		-		-	-	-			-				
Shatford Creek (27)													+		
Shingle Creek (Lower) (26)	-	+		+		-	+	-			-	-	-		
Shingle Creek (Upper) (25)													+		
Shuttleworth Creek (28)	-	-		-		-	-	-							
Vaseux Creek (33)	-	+		+		+	+	-			-				
+	Chinook eDNA PRESENT														
-	Chinook eDNA NOT DETECTED														



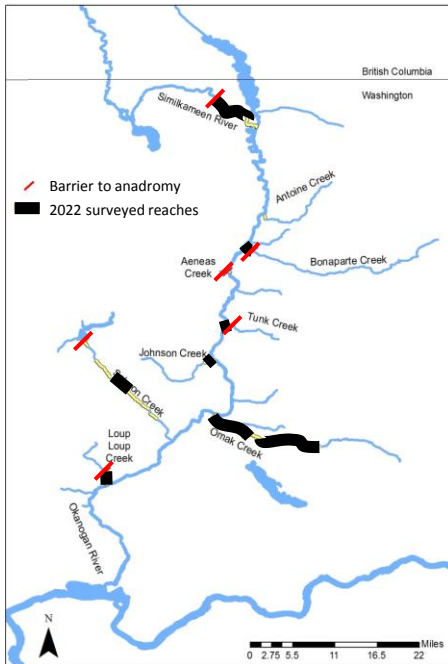
Lake Okanogan Habitat

2020

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



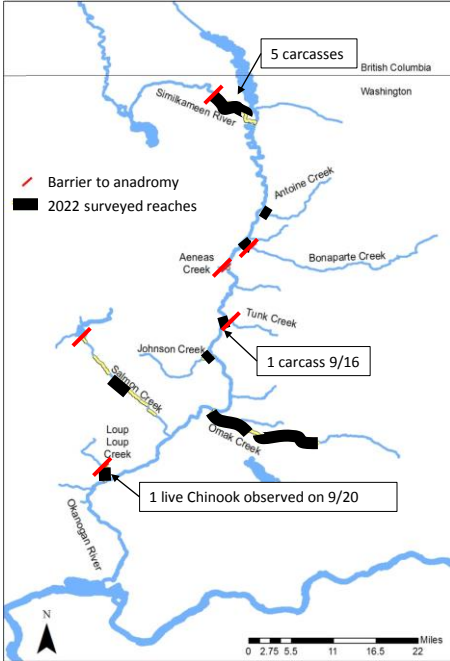
Visual redd & carcass surveys



Visual survey effort

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

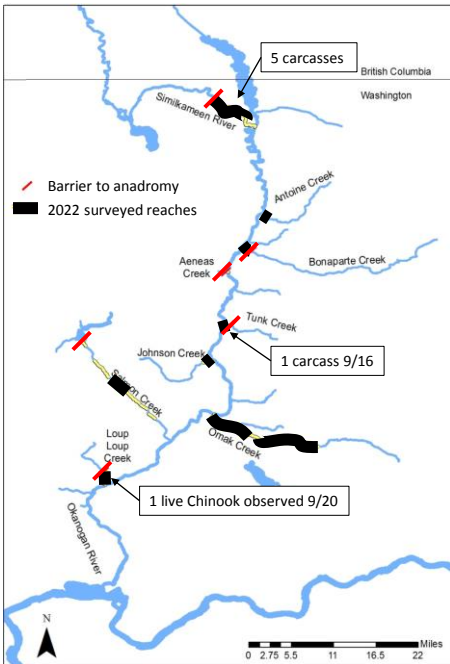
Visual redd & carcass surveys



Visual Survey Results

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

Visual redd & carcass surveys



Visual Redd Surveys

Take home for 2022:

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

Visual redd & carcass surveys

Carcass recoveries

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

Juvenile mark-recapture (OBMEP electro-fishing)

OBMEP Tributary Surveys

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



Juvenile mark-recapture (OBMEP electro-fishing)

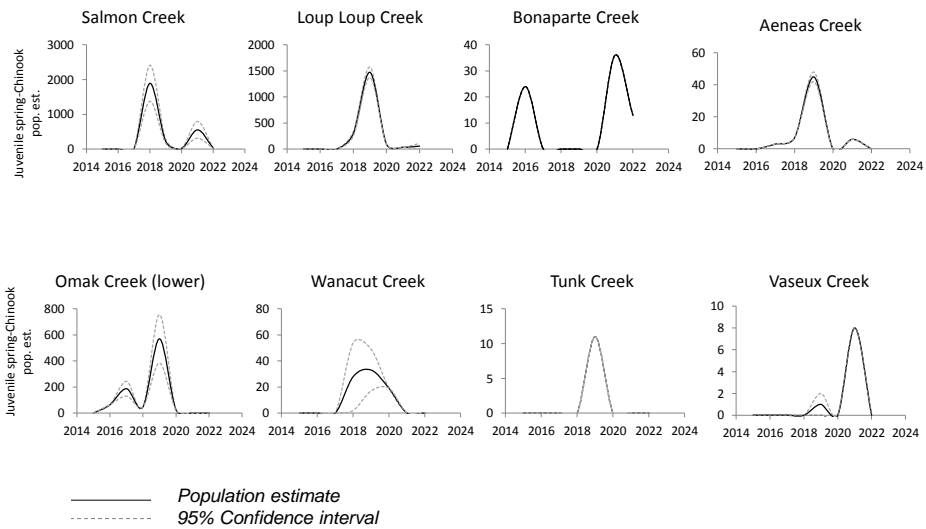
OBMEP Tributary Surveys

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



Juvenile mark-recapture (OBMEP electro-fishing)

OBMEP Tributary population estimates



Genetic analyses (PBT, GSI, Siblingship)



2018: 71 samples from juvenile Chinook in tributaries

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

2019: 32 samples from juvenile Chinook in tributaries

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

Genetic analyses (PBT, GSI, Siblingship)



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

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

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

Take home

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