

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

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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 Surveys (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

2021 Run Estimate to Okanogan

PIT tags

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

¹Based on PIT tags from Priest Rapids tagging effort²Includes 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
2021¹	2612	272	0	2884

¹Note: 2021 Hatchery Origin values comprised of

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

2021 Run Estimate to Okanogan

PIT tags

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

2021 Run Estimate to Okanogan

PIT tags

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

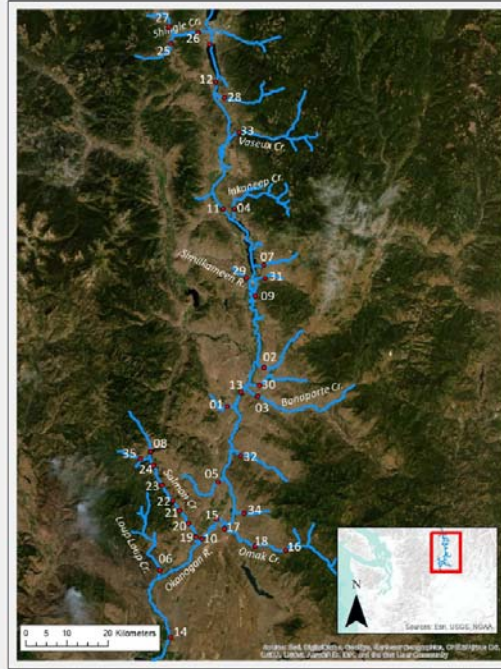
PIT tags

2021 Spawning Escapement to Okanogan

2021	Estimate
Run Estimate (<i>WDFW</i>)	2884
CJH removals	257
Spawning Escapement	880
<i>Unaccounted for</i>	<i>1747 61%</i>

eDNA – Evidence of successful reproduction

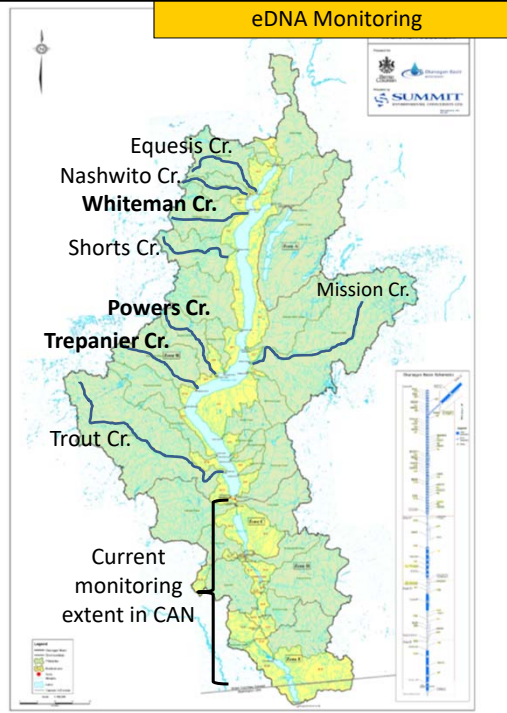
- Early detection, especially those tributaries that receive little visual survey effort
- 27 sites in tributaries
- 8 sites in mainstem Okanogan
- *Coordinating to add 8 sites in Lake Okanogan tributaries*



Lake Okanogan Habitat

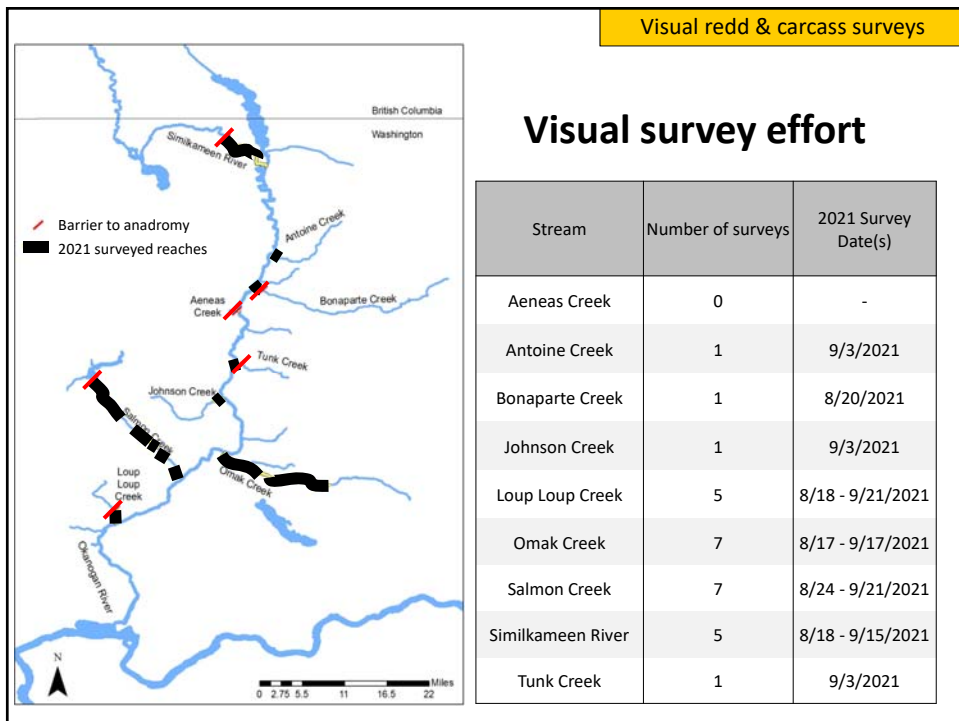
2020

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

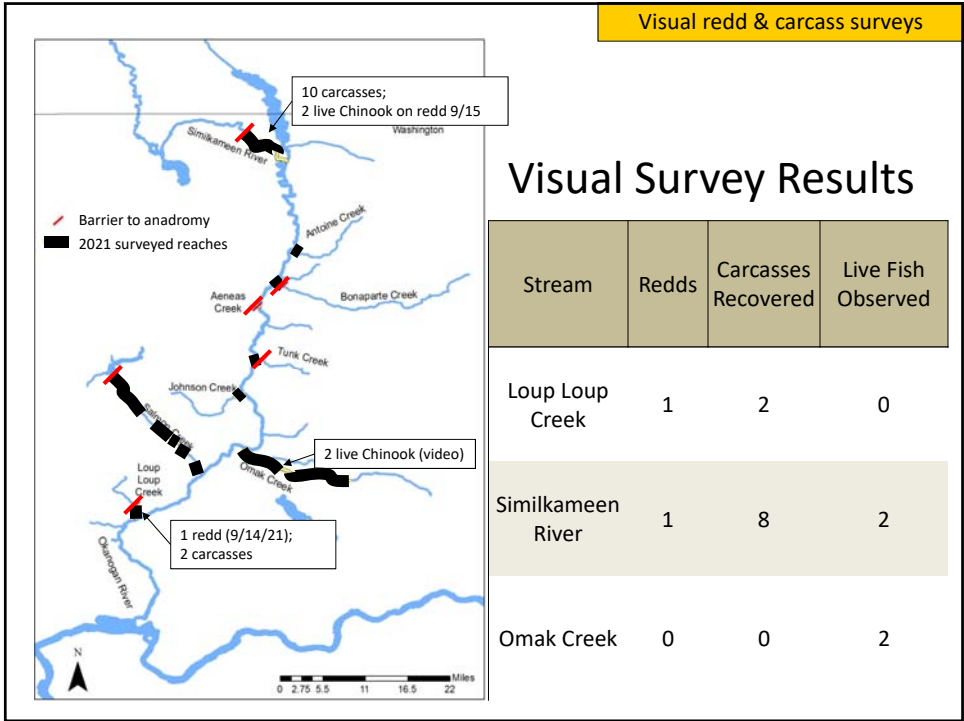


eDNA-based spatial distribution monitoring		eDNA Monitoring													
Site	Jun 2012	Aug 2012	Oct 2013	Sep 2014	2015	Sep 2016	Sep 2017	Mar 2018	Sep 2018	Mar 2019	Sep 2019	Mar 2020	Sep 2020	Mar 2021	Sep 2021
US Tributaries															
Aeneas Creek			-	-		-	+	-	-	-	-		x	-	x
Antoine Creek				+		+	-	+	-	+			x	-	x
Bonaparte Creek	-	+				-	+	-	+	-			x	-	x
Johnson Creek													x	-	x
Loup Loup Creek			-	+		+	+	-	+	+			x	-	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



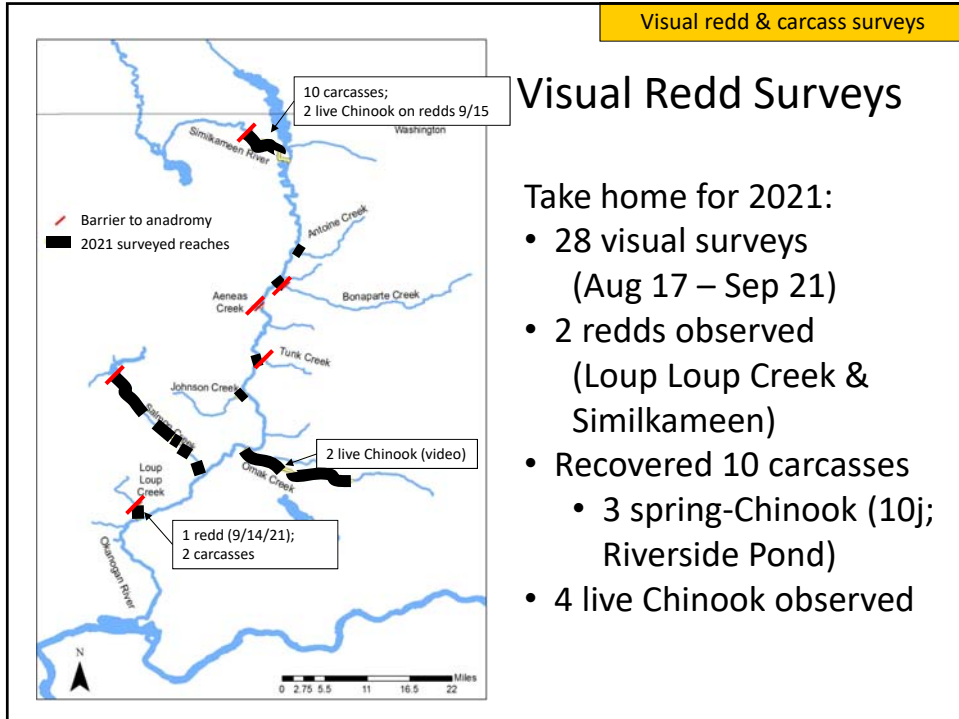
Visual Survey Results

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	-	-
Sep 8	Similkameen River	Spring	10j (Riverside Pond)
Sep 14	Loup Loup Creek	Spring	10j (Riverside Pond)



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

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

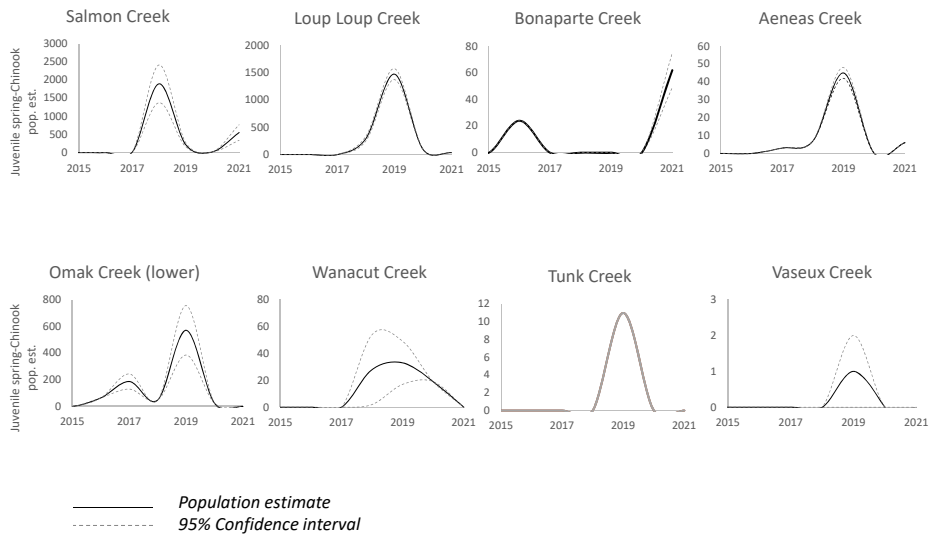


OBMEP Tributary Surveys

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



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