



Spring Chinook Salmon Spawning Ground Surveys above Green Peter Dam

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EAS ENVIRONMENTAL
ASSESSMENT
SERVICES



Wholly Owned Subsidiary of Natives of Kodiak

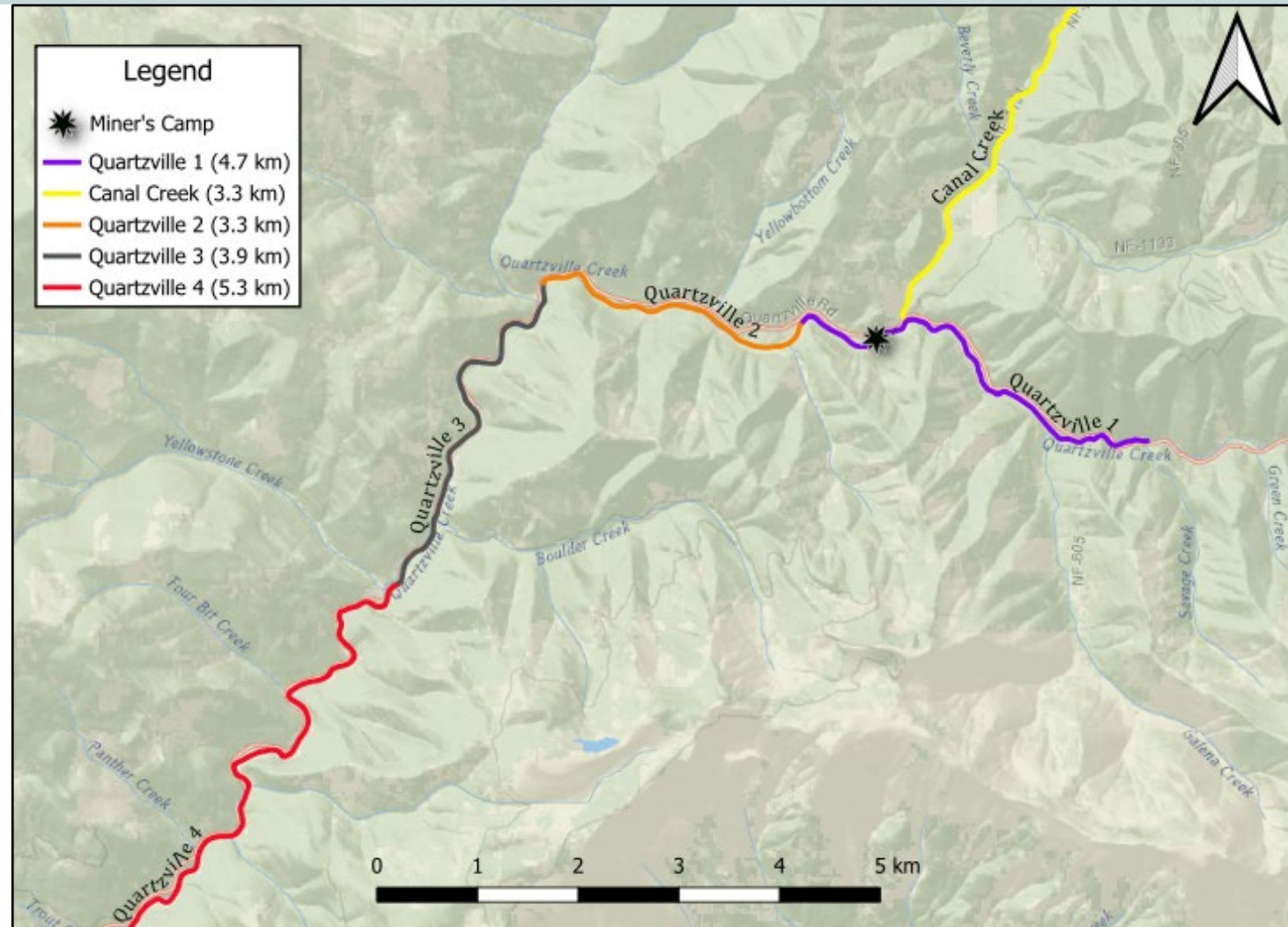
Objectives

- Conduct spring Chinook salmon (*Oncorhynchus tshawytscha*) spawning ground surveys above Green Peter Dam in Quartzville Creek and major tributaries.
- Determine abundance and distribution of spring Chinook salmon adults.
- Define redd distribution, composition, and longevity.
- Identify native origin and hatchery-reared Chinook salmon carcasses, sex, and prespawn mortality.
- Recognize and collect research tags and markers present in spring Chinook salmon.



Study Area

- 32 independent surveys conducted from September 28th, 2023, to November 15th, 2023.
- Surveys were conducted along 5 main reaches within Quartzville Creek
 - Quartzville 1 (4.7 km)
 - Canal Creek (3.3 km)
 - Quartzville 2 (3.3 km)
 - Quartzville 3 (3.9 km)
 - Quartzville 4 (5.3 km)
- In addition, exploratory tributaries were surveyed.
- Surveys began approx. 2 days after 100 female and 100 male Chinook salmon were outplanted at Miner's Camp.



Survey Effort



Survey Week	Date Range	No. of Surveys
1	September 24 th -30 th	2
2	October 1 st -7 th	6
3	October 8 th -14 th	9
4	October 15 th -21 st	3
5	October 22 nd -28 th	5
6	October 29 th -November 4 th	2
7	November 5 th - 11 th	0
8	November 12 th -18 th	5

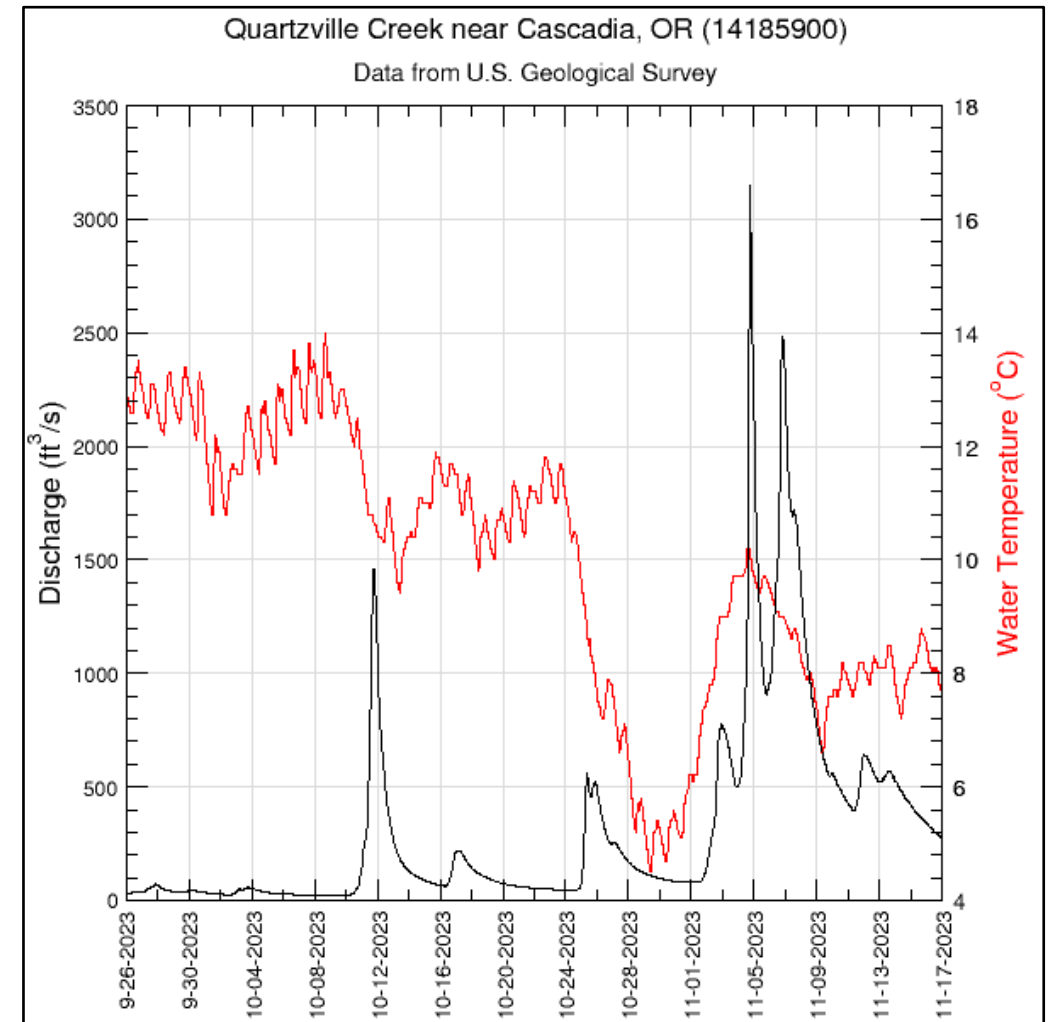
- Survey crews were composed of 2 individuals walking downstream on opposite sides of the river to collect;
 - Carcass demographics
 - Redd counts
 - Live fish observations
- Walking Stream Surveys
 - Low water, large rocks and woody debris preventing safe access via watercraft.
- Kayak-based Stream Surveys
 - Crews utilized inflatable kayaks to navigate specific reaches of Quartzville Creek when flow made passage on foot unsafe.

Methods

Safety Thresholds, Outplanting, and Survey Start



- Surveys were planned to be undertaken along each reach, once per week
 - Safety thresholds were set at ~ 400 cfs for surveys on foot and ~ 450 cfs for surveys via kayak.
 - Thresholds additionally set for water visibility/clarity.
- 200 adult Chinook salmon marked with floy tags were released at Miner's Camp by USACE and ODFW.
- Fish were released on September 26th, 2023
- First survey was completed on September 28th, 2023



Methods

Metrics Collected:



• **Overarching Observations:**

- Date
- Time
- Reach
- Water temperature
- Ambient temperature
- GPS starting and ending locations
- Photographs

• **Live Chinook Observations:**

- Number of Chinook salmon
- Sex
- Description of behavior
 - Migrating
 - Holding
 - Active Spawning
 - Competing
 - Redd Guarding
- Location type
 - Pools
 - Runs
 - Riffles
 - Glides

• **Carcasses Surveys:**

- Fish identification number
- Adipose fin present or absent
- Sex
- Morphometrics
 - Fork Length
 - MEPS
 - POHS
- Floy Tag number / presence or absence
- CWT (snout)
- DNA – Scales and Otoliths
- Egg retention percentage
- Potential scavenging / predation

• **Redd Enumeration:**

- Total redds / reach
- Nearest landmark was flagged
- Unique redd number
- Location description
- Redd status
- Water visibility
- Redd longevity / duration

Methods

Egg Retention



0%



5 - 10%



10 - 25%



25 - 50%



50 - 75%



100%

- Female Chinook salmon were used to determine prespawn mortality.
- Chinook salmon were assessed in hand.
- Carcasses retaining > 50% eggs were considered prespawn mortalities.
- Chinook salmon that died prior to spawning were recorded as having 100% egg retention.

Results

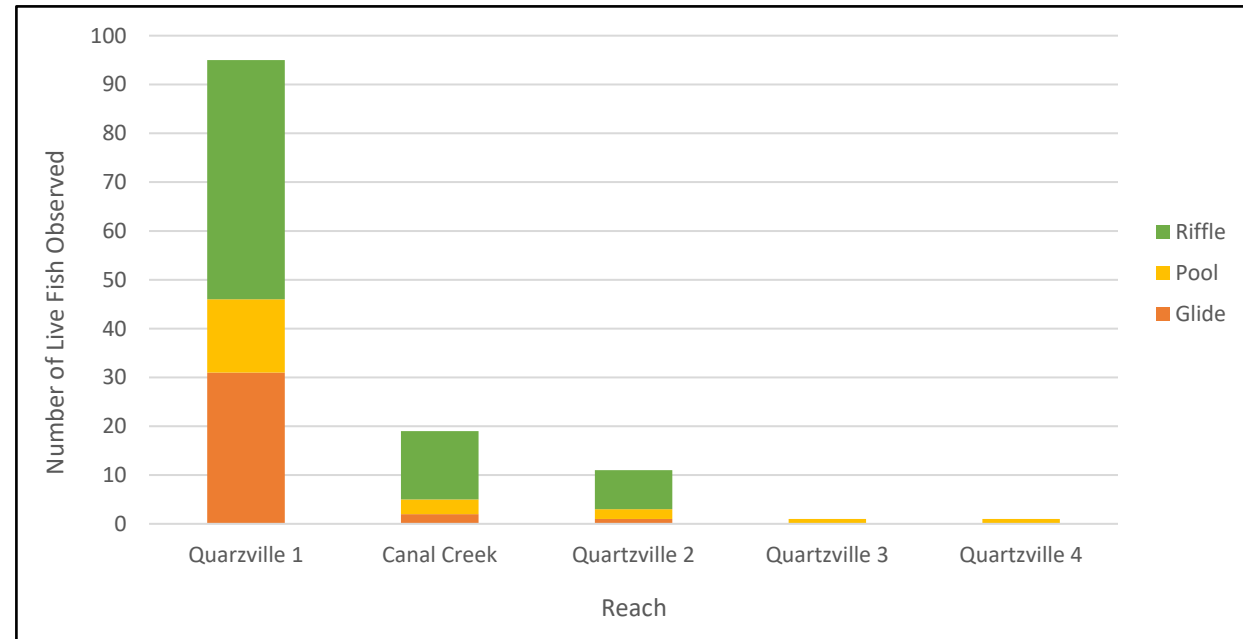
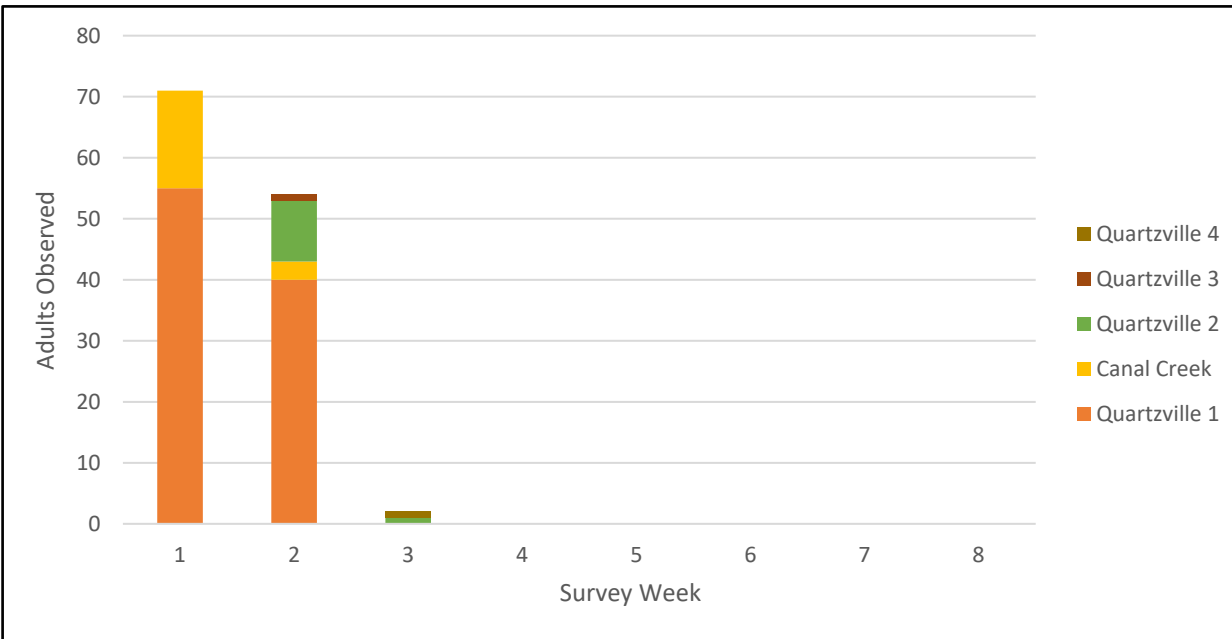
Water Quality

- Drastic changes in flow affected survey abilities and effort throughout the study.
- Water clarity was categorized into 3 levels:
 - Level 1: clear enough to see the bottom of pools and riffles
 - Level 2: clear enough to see the bottom of riffles, but not pools
 - Level 3: not able to see the bottom of pools or riffles
- Level 1 occurred in 87.5% of surveys
- Level 2 occurred in 9.4% of surveys
- Level 3 occurred in 3.1% of surveys
- EAS survey crews do not generally survey at Level 3 or above due to decreased visibility.



Results

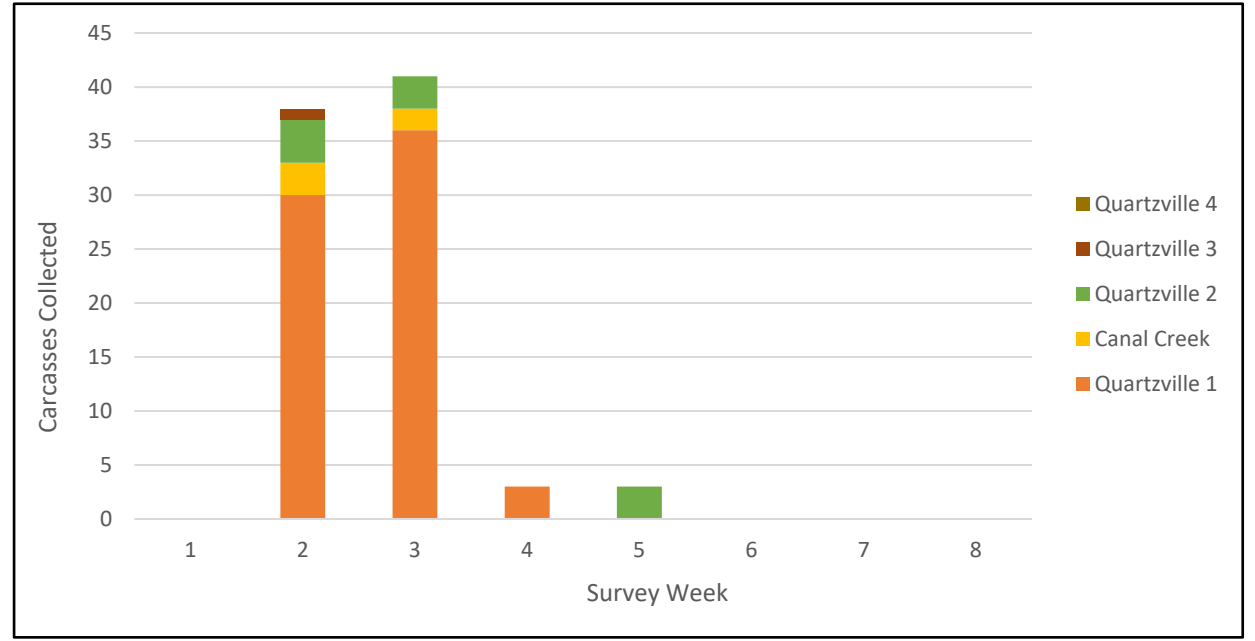
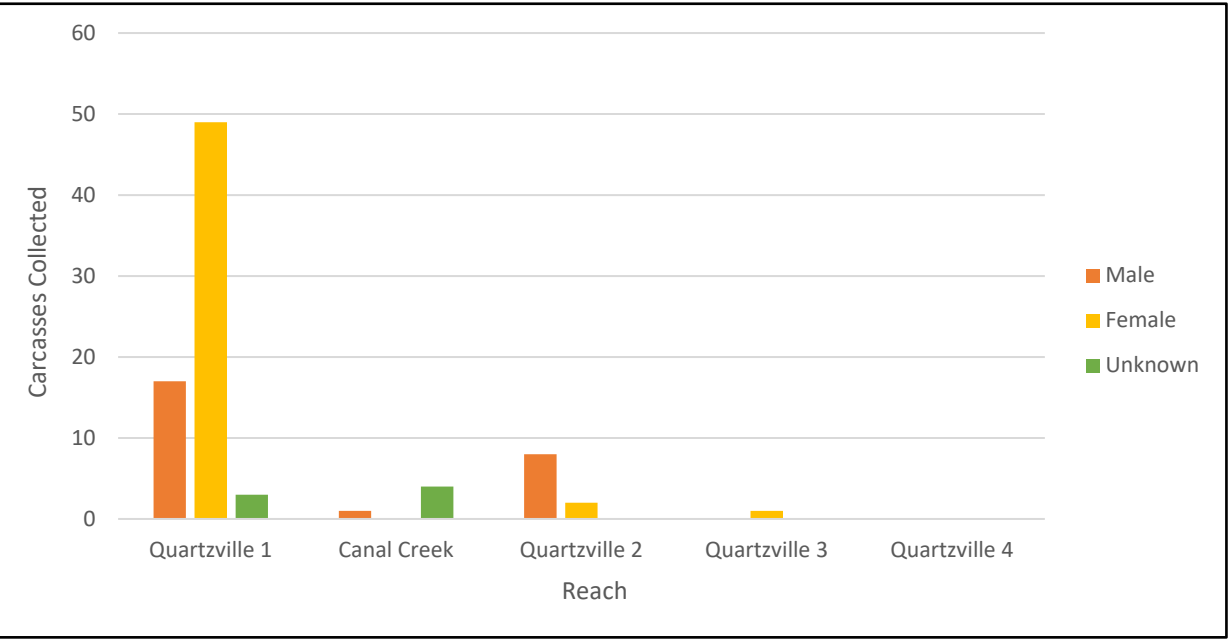
Adult Observations



- 127 live Chinook salmon were observed throughout the duration of the spawning surveys.
- Habitat location, behavior, and sex were recorded, where applicable.
- Highest number of observations of live fish occurred during week 1 of the surveys (September 28th – 30th, 2023).
- Quartzville Creek reach 1 had the most live fish sightings (directly above Miner’s Camp), with 95 fish observed (74.8% of all live fish sightings).
- During survey week 1, survey crews observed 71 live fish (55.9% of all live fish sightings).

Results

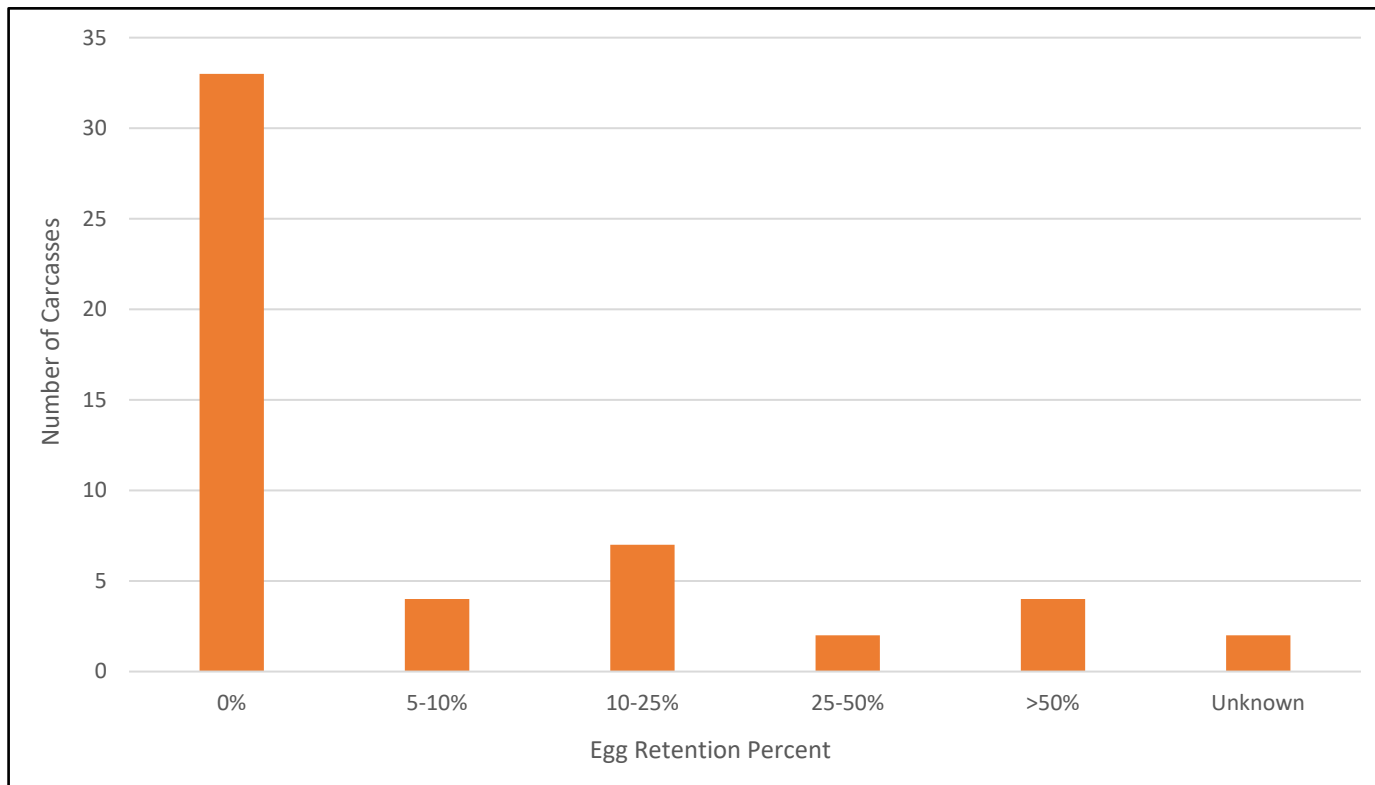
Carcass Survey Collections



- First carcass was collected October 3rd, 2023, approx. 8 days after initial outplanting at Miner’s Camp.
- Carcass collection surveys continued through November 15th, 2023, with the last carcass collected October 26th, 2023.
- Of the 200 (100 female and 100 male) outplanted Chinook salmon, 85 carcasses (42.5%) were collected by EAS.
- 52 (61.2%) were female, 26 (30.6%) were male and 7 (8.2%) were recorded as sex unknown due to heavy scavenging.
- 79 (92.9%) of carcasses were observed during survey week 2 and 3 (approx. 6-18 days after initial outplanting).

Results

Prespawn Mortality



- 52 female carcasses were collected and assessed for prespawn mortality.
- EAS survey crews were able to determine egg retention rates for 50 female carcasses (96.2%).
- 33 (63.4%) denoted as having 0% egg retention
- 4 (7.7%) denoted as having 5-10% egg retention
- 7 (13.5%) denoted as having 10-25% egg retention
- 2 (3.8%) denoted as having 20-50% egg retention
- 4 (7.7%) denoted as having >50% egg retention
- 2 (3.8%) of the carcasses were observed as having “unknown” egg retention due to the level of decay
- Chinook salmon having >50% egg retention were recoded as prespawn mortalities.
- 2023 surveys found that 8.0% of the observed carcasses were defined as prespawn mortality.
- 46 of 50 (92.0%) were found to have spawned during the duration of the surveys.

Results

Floy Tags and Coded Wire Tags (CWT)



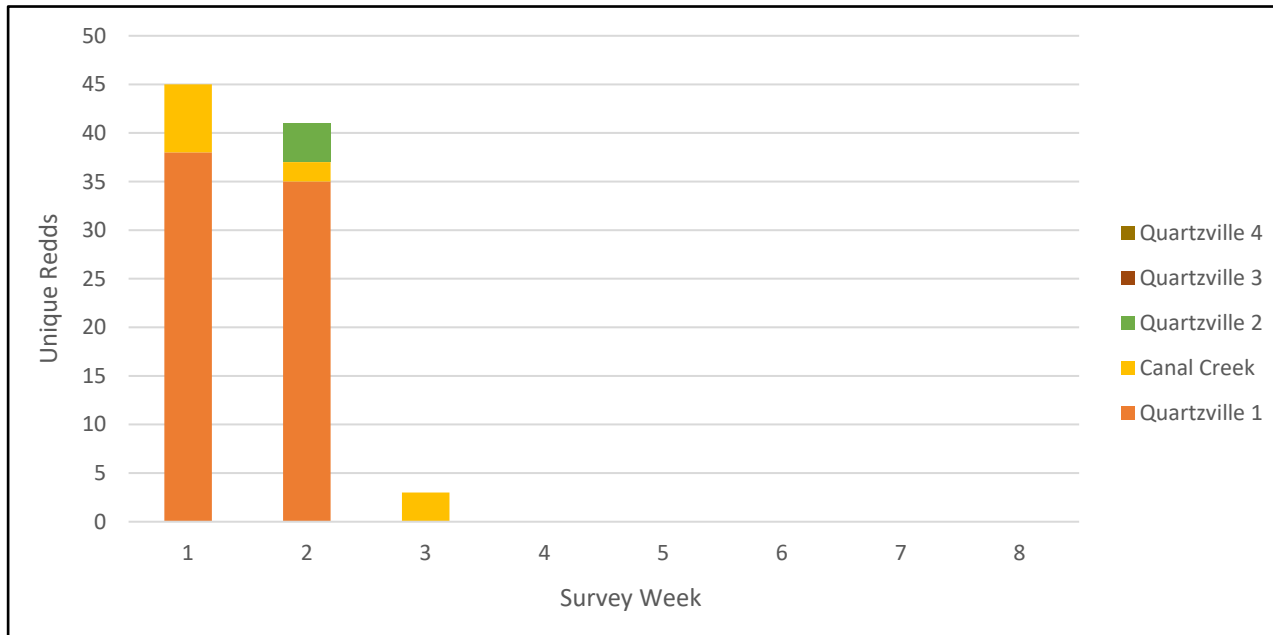
Floy Tags			
Reach	Carcass #	Missing Floy Tags	% Missing
Q1	69	12	17.4
Canal Creek	5	4	80.0
Q2	10	7	70.0
Q3	1	0	0.0
Q4	0	0	0.0
Totals	85	23	27.1



- EAS survey crews identified CWT and floy tag presence / absence.
- CWT's were detected in 5 (5.8% of total carcasses collected) of the 85 carcasses.
- Of the 85 carcasses, 23 (27.1%) had lost their floy tag prior to discovery.
- 6 female carcasses were recorded as having a red tag on their dorsal sinus. These fish had not been treated with erymycin antibiotic according to ODFW.

Results

Redd Counts



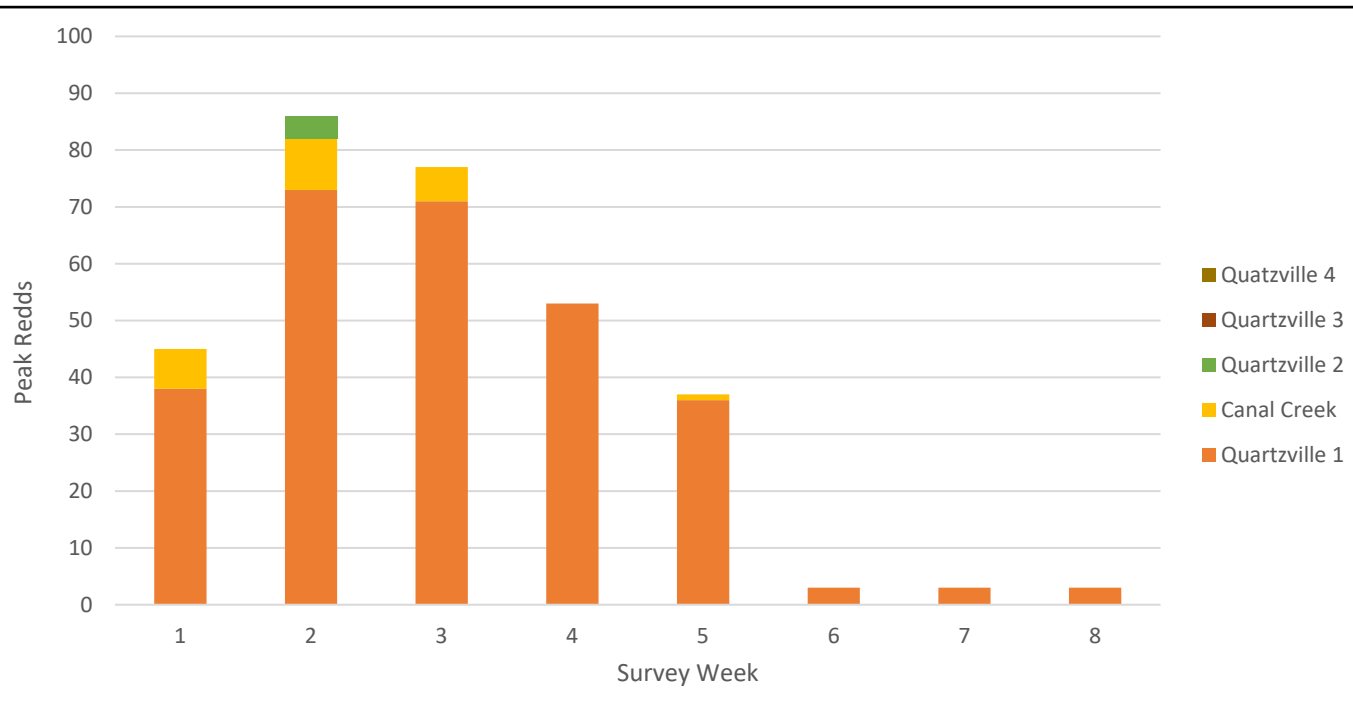
- In total, 89 unique redds were observed throughout the duration of the surveys.
 - Quartzville 1 – 73 (82.0%) redds
 - Canal Creek – 12 (13.5%) redds
 - Quartzville 2 – 4 (4.5%) redds
 - 0 redds observed in Quartzville 3 and 4

- EAS survey crews first observed Chinook salmon constructing redds on September 28th, 2023 (1st day of surveys and 2 days after initial release).



Results

Peak Redd Counts



- Peak redd counts for all reaches were observed during survey week 2 (October 1st – 7th, 2023).
- Peak redd counts occurred approx. 4-10 days after the 200 Chinook salmon adults were outplanted.
- Redd construction began in survey week 1 (September 24th – 30th, 2023), peaked during survey week 2 and was completed by survey week 3 (October 8th – 14th, 2023).
- At the completion of survey week 6 (October 29th – November 4th, 2023), 86 redds (96.6% of total observed unique redds) were no longer visible to survey crews.

Results

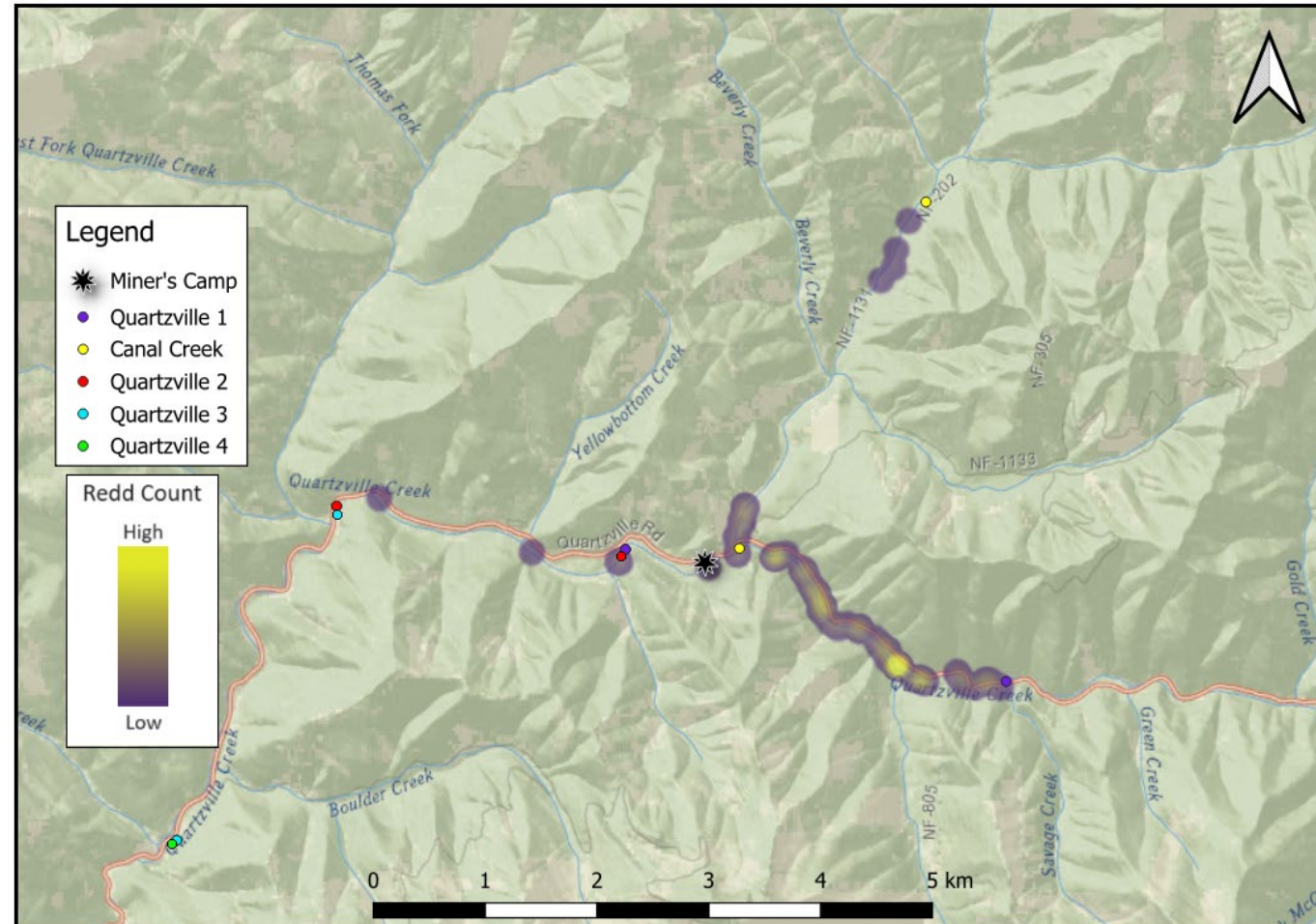
Redds



Results

Redd Distribution

- Redd distribution density was highest upstream of the Miner's Camp outplanting site.
- EAS survey crews observed that Canal Creek had redds at the beginning and end of its respective reach.
- There were 0 redds observed within Quartzville reaches 3 and 4.



Additional Observations

- EAS survey crews witnessed very few members of the general public using Quartzville creek for recreational purposes.
 - 2022 surveys noted that the area was heavily utilized for daytime activities including swimming and fishing.
- Crews did not observe any Kokanee (*O. nerka*) spawning within Quartzville creek.
 - 2022 surveys observed Kokanee spawning throughout Quartzville reaches 2, 3, and 4, in high densities.
 - The lack of observed Kokanee during 2023 could be a potential result of deep draw downs in 2023, preventing access for Kokanee to spawn within these reaches, or providing alternative areas to spawn further downstream.
- Test redds were observed while surveying reaches of Quartzville Creek in addition to the predefined survey area.
 - Test redds were observed in Galena Creek and were recorded for future studies.



Discussion

Survey Effort, Carcass Recovery Rates, and Prespawn Mortality



- **Survey Effort**

- Survey effort throughout the project was heavily impacted by weather and subsequent flows.

- **Carcass Recovery Rates**

- Carcass recovery rates ranged from 0% in Quartzville 4 to 81.2% within Quartzville 1.
- Of the 200 fish released, 85 carcasses were recovered and sampled (42.5%).
- Carcass recovery rates were high during the first two survey weeks and decreased after large rain events occurred. These rain events increased mainstem flow from ~30 cfs to >1,400 cfs.
- Following this event, only 6 additional carcasses were discovered throughout the remainder of the surveys.
- Similar to findings collected by CFS in 2022, EAS found that the largest proportion of carcasses recovered came from both Quartzville 1 and Canal Creek, while very few carcasses were found further downstream within Quartzville 3 and Quartzville 4 reaches.

- **Prespawn Mortality**

- EAS found prespawn mortality of hatchery origin Chinook salmon within Quartzville Creek to be 8.0%. Comparatively, CFS found that prespawn mortality during the 2022 spawning surveys was 11.1%.
- Research within the Willamette Basin from 2017-2023 evidenced Chinook salmon prespawn mortality rates ranging from 1-100% over a 14-year study duration. Both the 2022 and 2023 prespawn mortality rates could therefore be categorized as low.
- With a spawning success rate of 89% and a prespawn mortality of 8.0%, we can hypothesize that high water events, elevated temperatures and late outplanting at the Miner's Camp could potentially account for the remaining 3% of Chinook salmon.
- Outplanting of Chinook salmon from the previous year commenced on September 8th, 2022, and outplanting for this year's surveys commenced September 26th, 2023, approximately 18 days later. The difference in outplanting dates could be somewhat responsible for the decreased prespawn mortality rates evidenced in 2023.

Discussion

Enumerating Redds and Spawning Habitat



- Spawning quality, the timeline of outplanting adult fish, and relative river conditions all impact the success of redds in the system.
- In 2022, 200 Chinook salmon adults were released on September 8th, approx. 18 days earlier than the release taking place in 2023 (September 26th).
- CFS personnel did not observe redd formation until survey weeks 2 and 3, whereas EAS personnel observed 45 redds within survey week 1.
- This could indicate that hatchery-reared Chinook females were ripe upon release in September 2023 and when compared to 2022 outplanting.
- Observing 82.0% of all total redds in the Quartzville 1 reach could indicate that the Chinook salmon were ready upon outplanting, or even past their peak spawning window and subsequently did not have the energy to explore areas further away from Miner's Camp, or to find additional, potentially more suitable habitat.
- In 2022, peak flow discharge was recorded at 70 cfs and remained between 25 and 40 cfs for the majority of survey weeks.
- In 2023, adult Chinook salmon experienced a peak flow discharge of 3,150 cfs during survey week 7 and additional smaller flow events of 2,500 cfs (November 6th), 1,480 cfs (November 11th), and 764 cfs (November 2nd).
- Availability of suitable spawning habitat plays a large role in redd distribution. Quartzville 1 has adequate spawning habitat, but it was also the habitat that would have been discovered immediately upstream of the drop site. Several redds were discovered in Canal Creek but were located only at the very beginning and very end of that reach, respectively. The middle section of Canal Creek predominantly consists of deep pools and bedrock, with very little spawning gravel and minor suitable flow.

Acknowledgements



- USACE:
 - Robert Wertheimer and Steven Sachs
- EAS:
 - Dillon Alegre, Rachel Ellison, Mark Morasch, Joe Welch, Skylar O'Rourke, Ellie Rondon, Bailey Morgan, Kelsey Scott, Drake Scrafford, Ryan Chen, and Cole Hutson

Questions?

