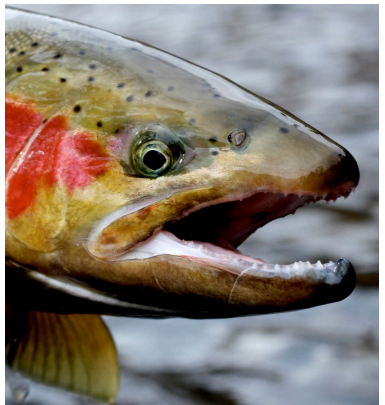
Evaluation of Steelhead Passage at the SF Clearwater River High-Velocity Reach, Draft

Mike Ackerman, Ryan Kinzer, Miranda Gordon, Peter Cleary

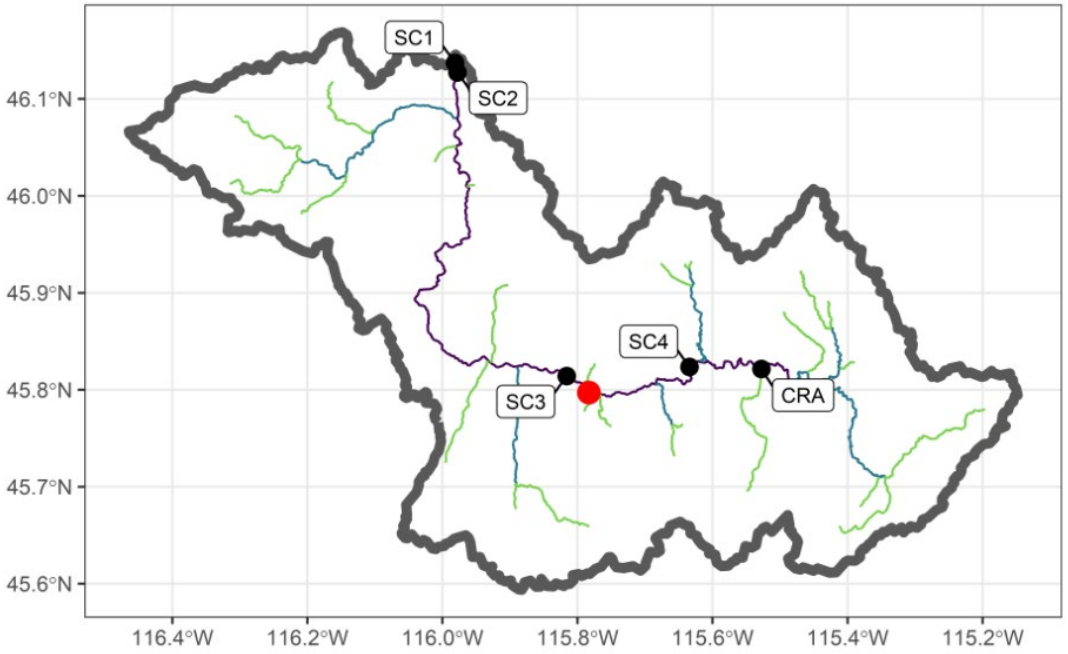
Clearwater Basin Coordination Meeting – June 6, 2024

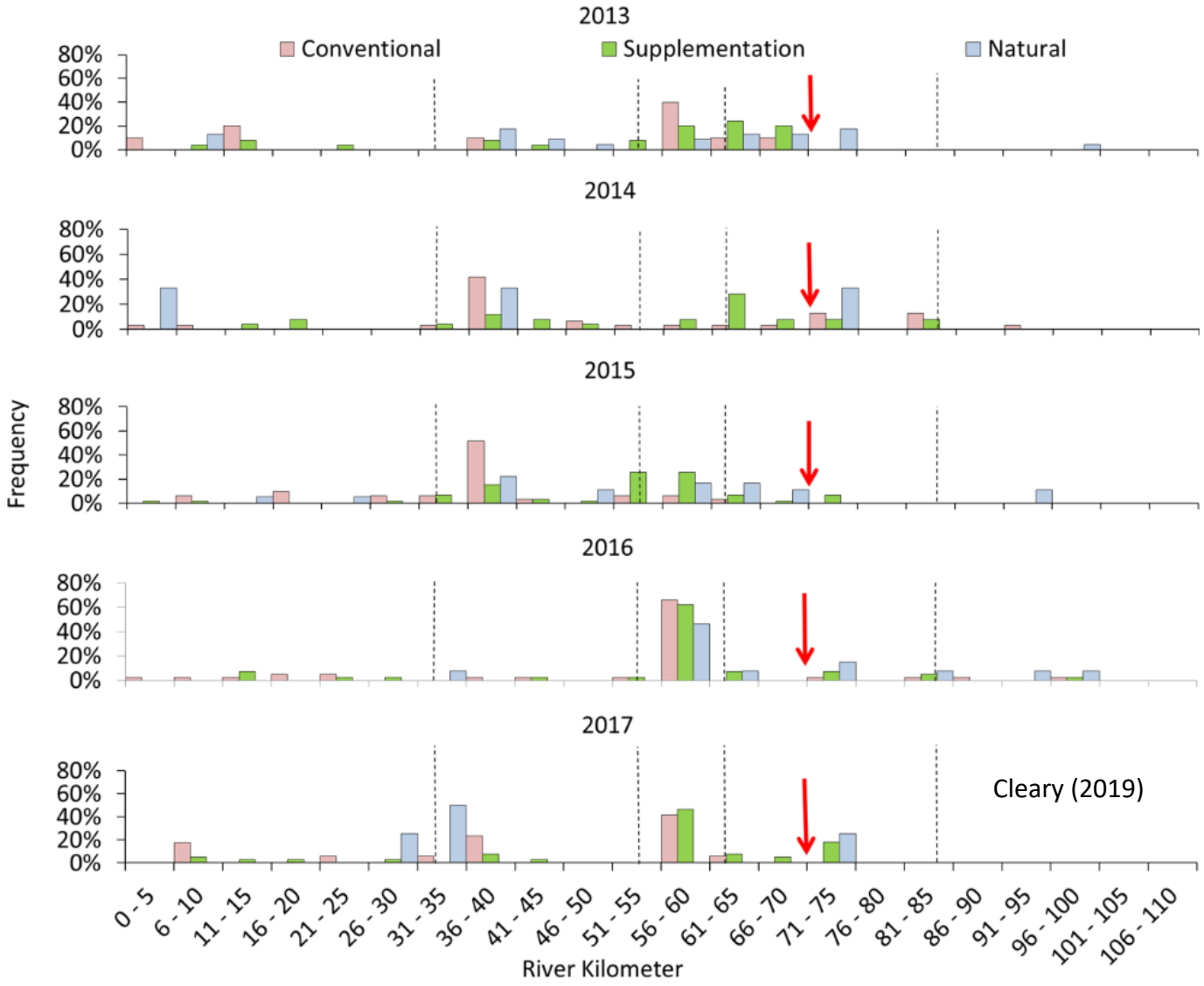




High-Velocity Reach

- River kilometer 71
- Hypothesized as potential partial barrier to adult steelhead passage at higher flows
- Few adult steelhead distributed to spawn above rkm 71 during a radio telemetry study, 2013 - 2017

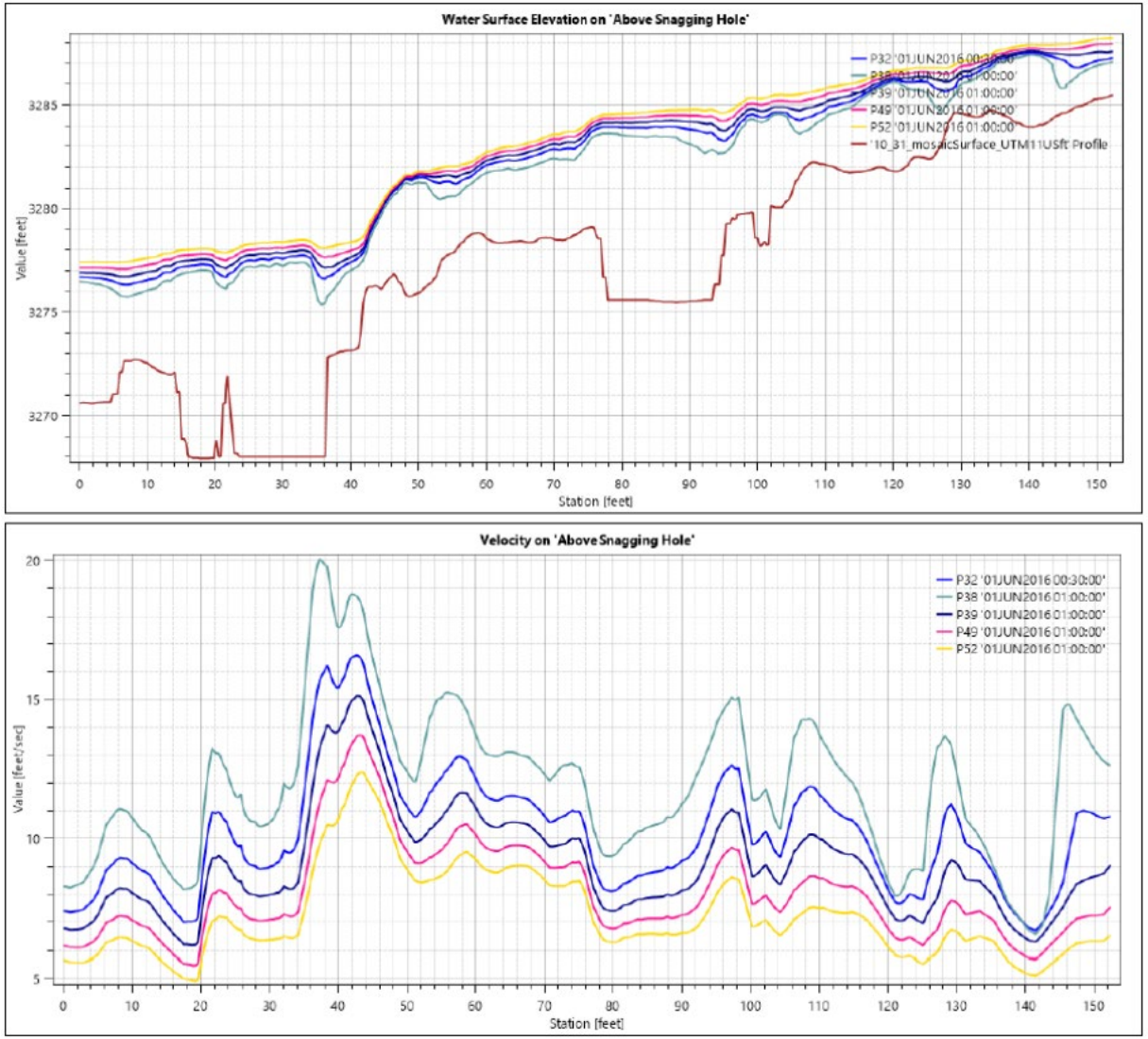




Cleary (2019)

High-Velocity Reach

- As discharge exceeds 1,000 cfs, at least one velocity barrier emerges, exceeding burst swimming velocities for a 90 cm steelhead (Timms et al. 2017, 2018)



Evaluation

- SC3 & SC4 installed August 2021
- Number of PIT-tagged juveniles within Newsome Creek releases increased in 2022
  - 1-ocean returns from 2022 releases started returning spring 2024
- Queried DART for any adults later observed at any IPTDS within SF Clearwater
  - Spawn years 2022 – 2024
- Evaluated conversion rates from SC3 -> SC4
  - Covariates: release location, discharge
- Chinook salmon included for comparison

Table 1.1: Number of PIT-tagged juveniles released (or anticipated) within Newsome Creek releases by year, including years that each release group will return to spawn.

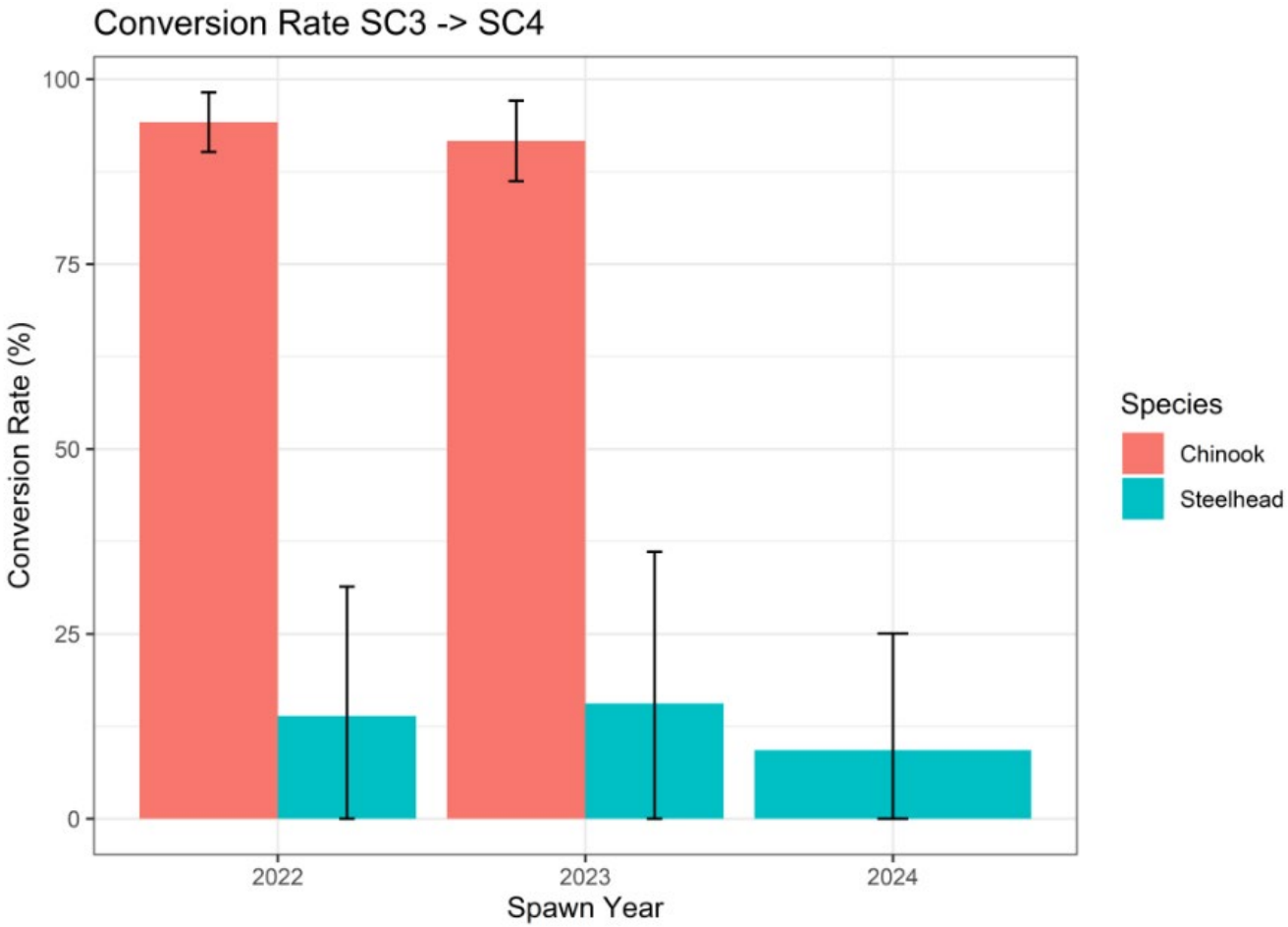
Release Site	Release Year	Tag Count	SW Age 1 SY	SW Age 2 SY
NEWSOC	2014	1496	2016	2017
NEWSOC	2015	1501	2017	2018
NEWSOC	2016	5980	2018	2019
NEWSOC	2018	2590	2020	2021
NEWSOC	2019	2535	2021	2022
NEWSOC	2020	2563	2022	2023
NEWSOC	2021	5989	2023	2024
NEWSOC	2022	15689	2024	2025
NEWSOC	2023	15866	2025	2026
NEWSOC	2024	15900	2026	2027
NEWSOC	2025	15900	2027	2028
NEWSOC	2026	15900	2028	2029

Conversion Rates

Table 2.1: Estimated tags observed at SC3 and SC4 by species and spawn year including conversion rates.

Species	Spawn Year	Est Tags SC3	Est Tags SC4	Conversion (%)	Conversion SE
Chinook	2022	138	130	94.2	2.0
Chinook	2023	108	99	91.7	2.8
Steelhead	2022	108	15	13.9	8.9
Steelhead	2023	77	12	15.6	10.5
Steelhead	2024	140	13	9.3	8.0

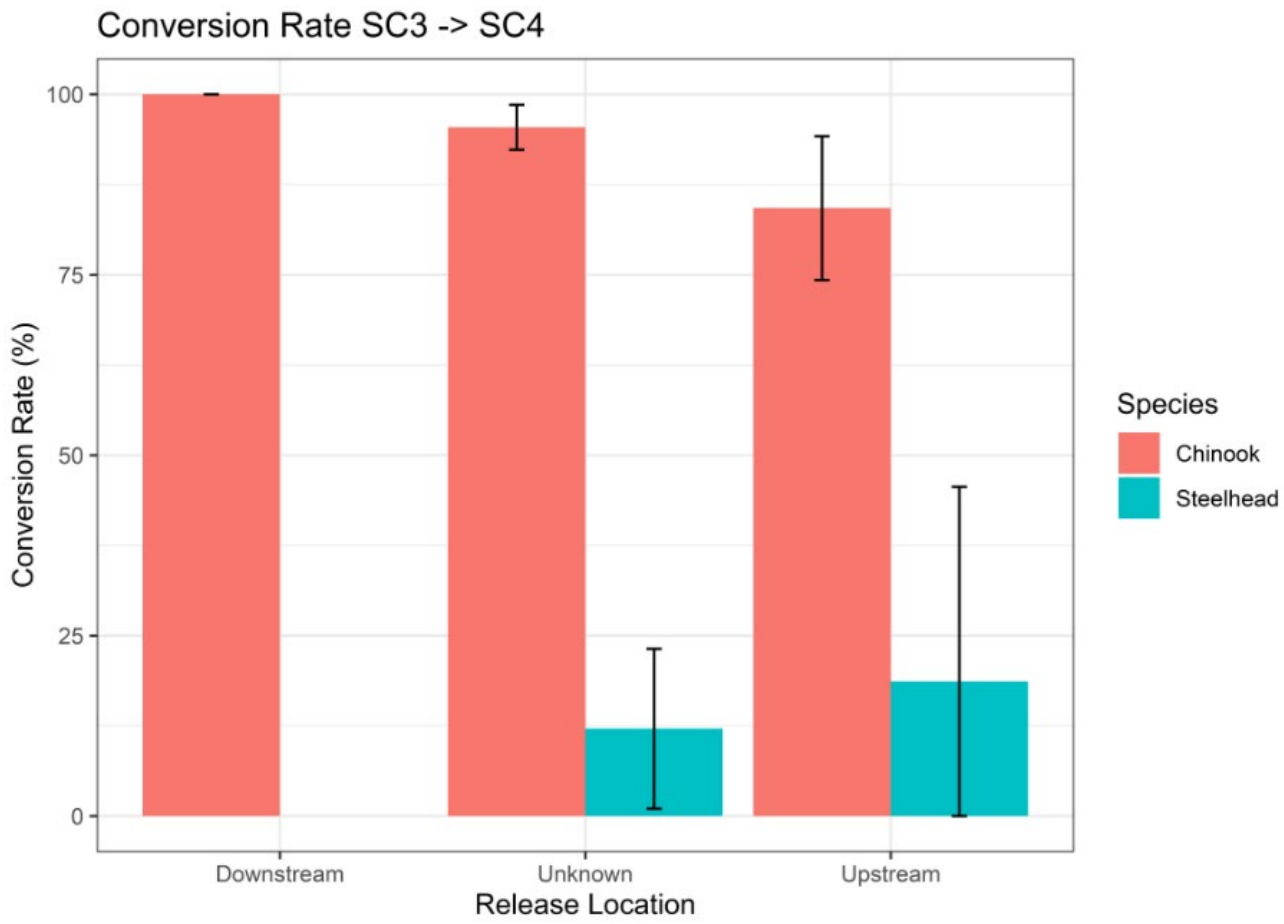
- Steelhead conversion rates substantially lower than Chinook salmon
- Confounding factors:
  - Returning adult steelhead predominantly from downstream juvenile releases
  - Chinook salmon likely have higher propensity to migrate to upstream natal areas



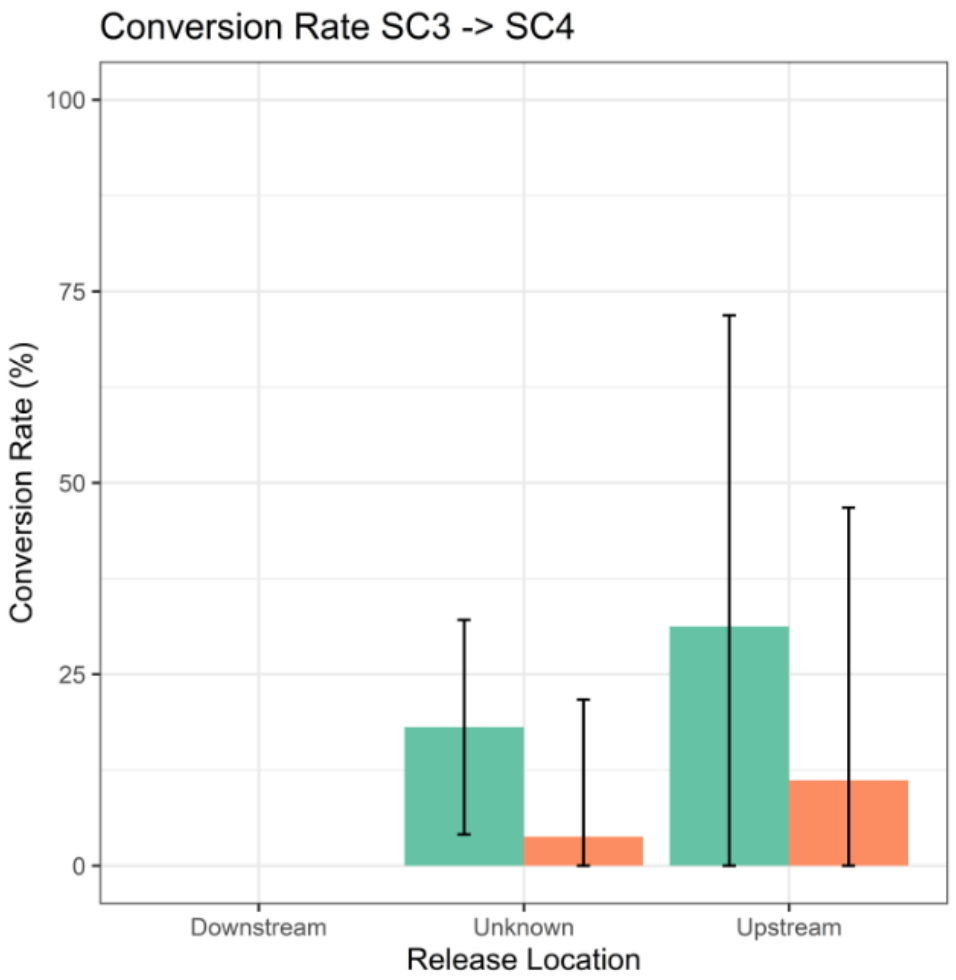
Release Location

Species	Release Location	Obs Tags	Est Tags SC3	Est Tags SC4	Conversion (%)	Conversion SE
Chinook	Downstream	32	9.3	9.4	100.0	0.0
Chinook	Unknown	263	179.9	171.7	95.4	1.6
Chinook	Upstream	65	61.0	51.4	84.2	5.1
Steelhead	Downstream	224	14.9	0.0	0.0	–
Steelhead	Unknown	1229	275.4	33.4	12.1	5.6
Steelhead	Upstream	70	42.9	8.0	18.6	13.8

- Years pooled due to lower sample sizes
- Conversion rates for Newsome Creek releases higher (not significantly) than downstream releases
- But still substantially lower than Chinook salmon



Discharge



Species	Release Location	Est CFS (Elk City)	Obs Tags	Est Tags SC3	Est Tags SC4	Conversion (%)	Conversion SE
Steelhead	Downstream	abv_500	11	11.3	0.0	0.0	–
Steelhead	Unknown	abv_500	132	115.2	4.4	3.8	9.1
Steelhead	Upstream	abv_500	26	26.9	3.0	11.1	18.2
Steelhead	Downstream	blw_500	213	3.6	0.0	0.0	–
Steelhead	Unknown	blw_500	1097	160.2	29.0	18.1	7.2
Steelhead	Upstream	blw_500	44	16.0	5.0	31.2	20.7

- Steelhead only, years pooled
- Conversion rates lower at flows > 1,000 cfs
- Upstream releases only:
  - 11.1% at flows > 1,000 cfs
  - 31.2% at flows < 1,000 cfs

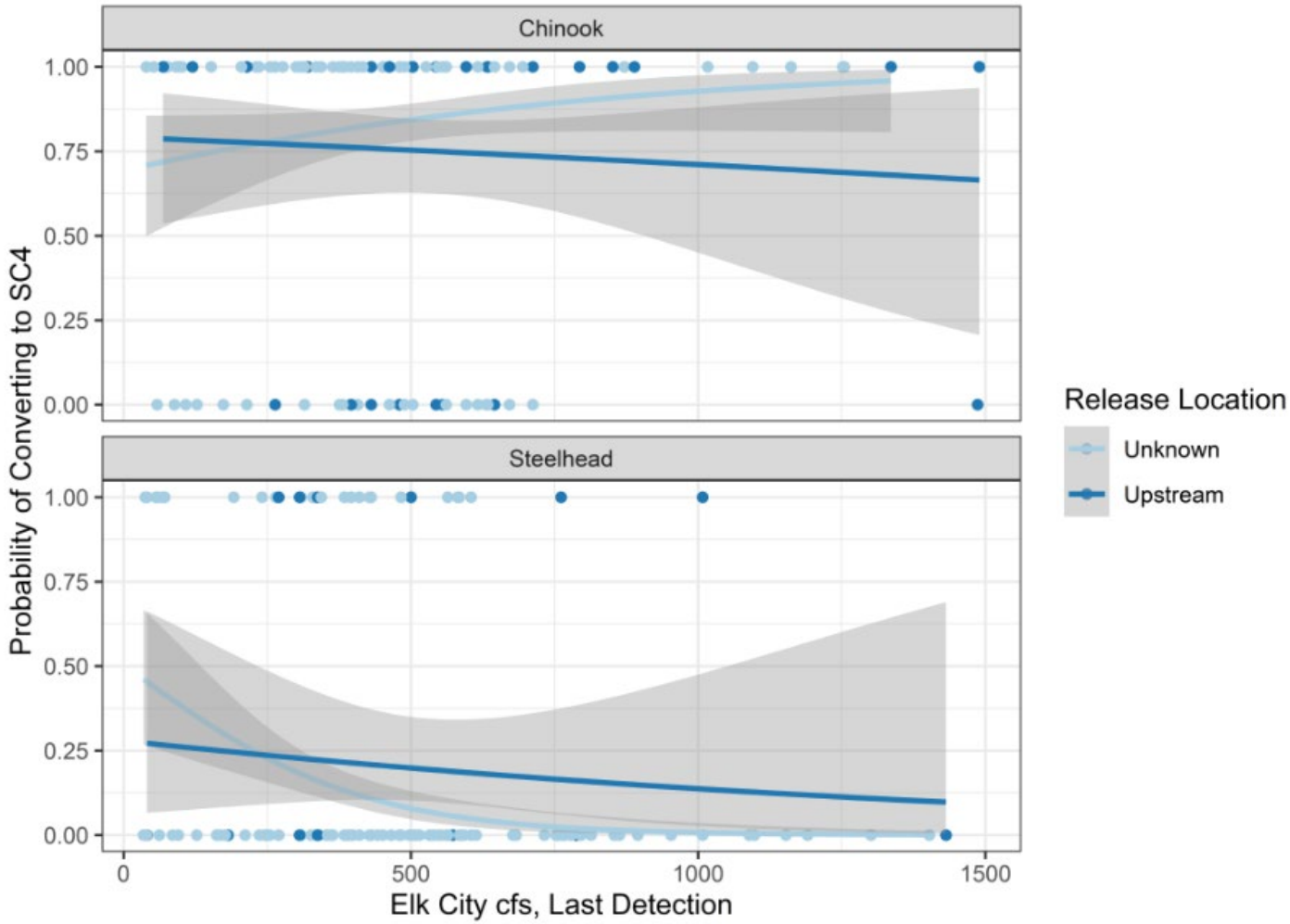
Logistic Regression

- Estimated probability of adult converting to SC4, given it arrived at SC3
- Depending on:
  - Species
  - Release Location
  - Estimated Flow at Elk City

- Estimated downward trend in probability of adult steelhead converting to SC4 at higher flows

- ~ 25% at 250 cfs (500 at reach)
- ~ 20% at 500 cfs (1,000 at reach)

- Low sample sizes at some flows i.e., large standard errors



Preliminary Conclusions

- Adult steelhead conversion rates SC3 -> SC4 are low

- However, unknown why conversion rates are substantially lower than for Chinook salmon at similar flows
  - Body size differences?
  - Swimming capabilities?
  - Propensity to migrate upstream?

- Baseline monitoring established to evaluate effects of any actions to alleviate high-velocity issues
  - E.g., Before-after logistic regression. Does slope or relationship change post-action?

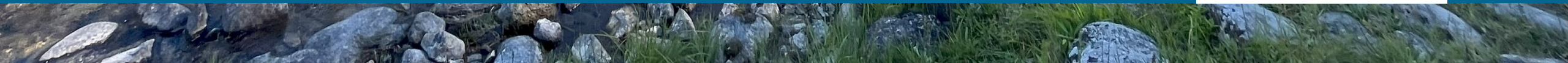
- Evaluation will be updated annually after each steelhead run, supported by increased Newsome Creek releases
  - Increased sample size will improve precision and ongoing monitoring

mikea@nezperce.org

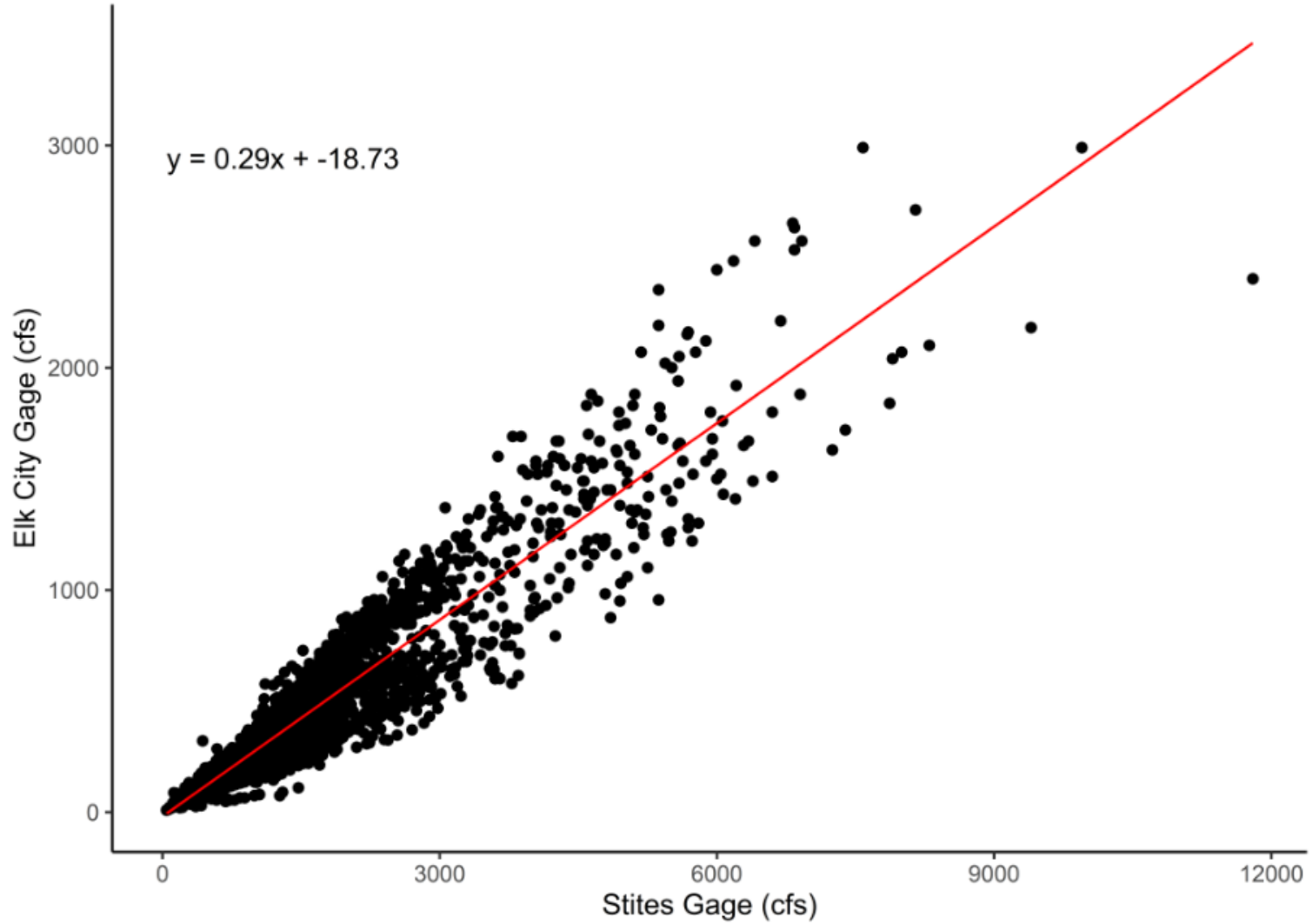
https://github.com/NPTfisheries
https://github.com/mackerman44

www.nezperce.org

O: 208-634-5290 x3302
C: 208-469-0896



Elk City vs. Stites Linear Regression



IPTDS Detection Probabilities

Table 6.1: Estimated season-wide detection probabilities for IPTDS located on the South Fork Clearwater River by species and year.

Species	Spawn Year	Site	Obs Tags	Obs Tags Above	Resighted Tags	Detection Prob (%)	Detection SE
Chinook	2022	SC1	174	170	146	85.7	1.1
Chinook	2023	SC1	149	141	132	93.7	0.7
Chinook	2022	SC2	105	137	72	52.8	2.4
Chinook	2023	SC2	112	108	79	73.2	2.3
Chinook	2022	SC3	133	110	106	96.4	0.8
Chinook	2023	SC3	108	91	91	100.0	0.0
Chinook	2022	SC4	108	11	9	83.1	9.8
Chinook	2023	SC4	90	10	9	90.9	7.9
Steelhead	2022	SC1	328	269	251	93.2	0.7
Steelhead	2023	SC1	575	498	487	97.8	0.2
Steelhead	2024	SC1	547	388	349	90.0	0.9
Steelhead	2022	SC2	245	71	47	66.6	4.9
Steelhead	2023	SC2	486	77	65	84.5	3.8
Steelhead	2024	SC2	319	140	71	51.0	3.7
Steelhead	2022	SC3	66	12	7	61.1	11.9
Steelhead	2023	SC3	77	12	12	100.0	0.0
Steelhead	2024	SC3	140	13	13	100.0	0.0
Steelhead	2022	SC4	11	3	2	73.3	17.1
Steelhead	2023	SC4	12	3	3	100.0	0.0
Steelhead	2024	SC4	13	2	2	100.0	0.0

Length at Saltwater Age