

Downstream Migration and Survival of Juvenile Chinook Salmon and Steelhead in the Lower Yakima River, Washington, 2018-2023

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¹U.S. Geological Survey

²Yakama Nation Fisheries

³Bureau of Reclamation

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Research Funding Sources

Yakama Nation Fisheries

Bureau of Reclamation

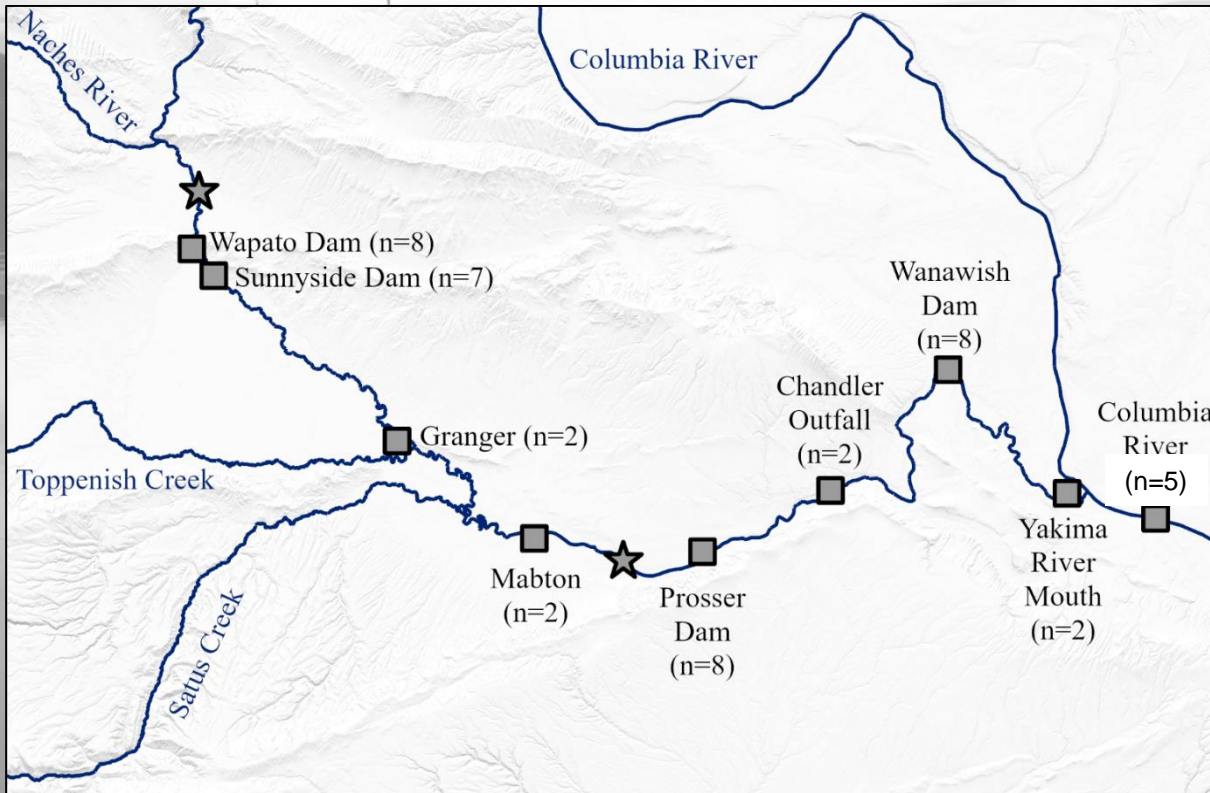
U.S. Geological Survey

Yakima Basin Joint Board

Kennewick Irrigation District

U.S. Department of the Interior
U.S. Geological Survey

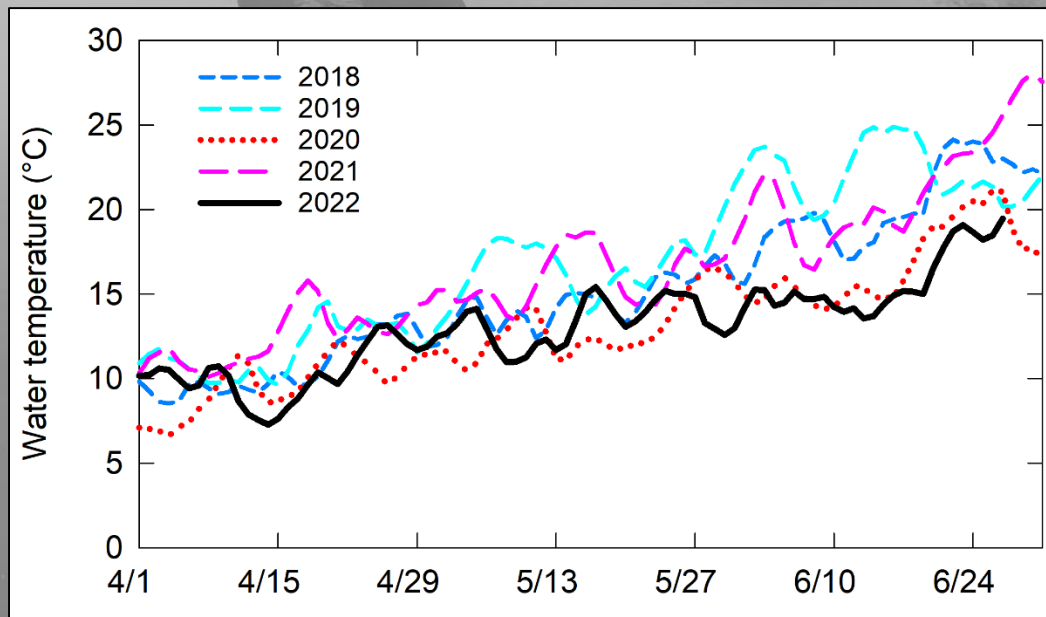
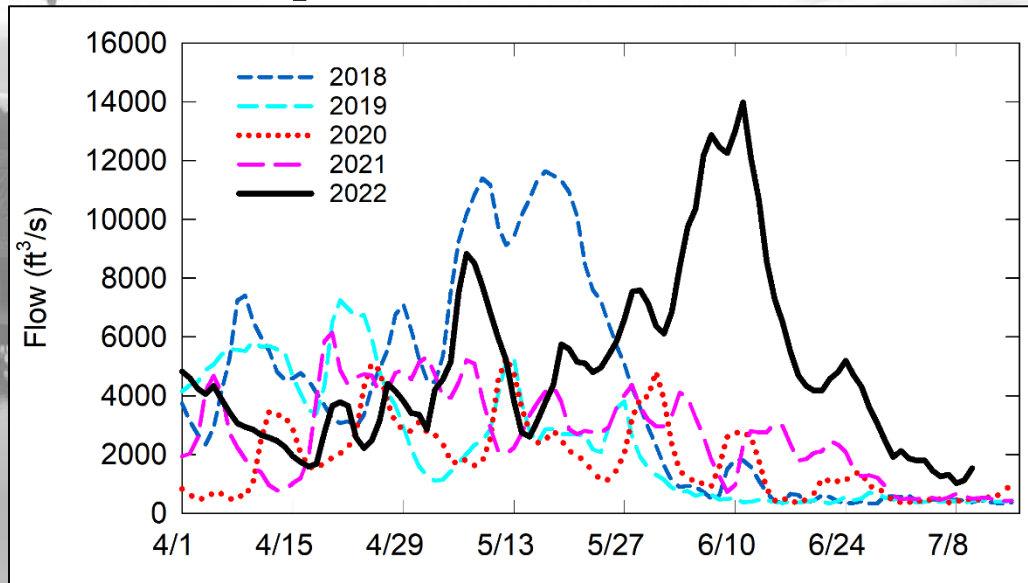
Study Details



- Covariates of Interest**
- River flow
 - Reach-specific flows
 - Water temperature
 - Route-specific passage
 - Predation
 - Turbidity
 - Fish size
 - Day of year, week

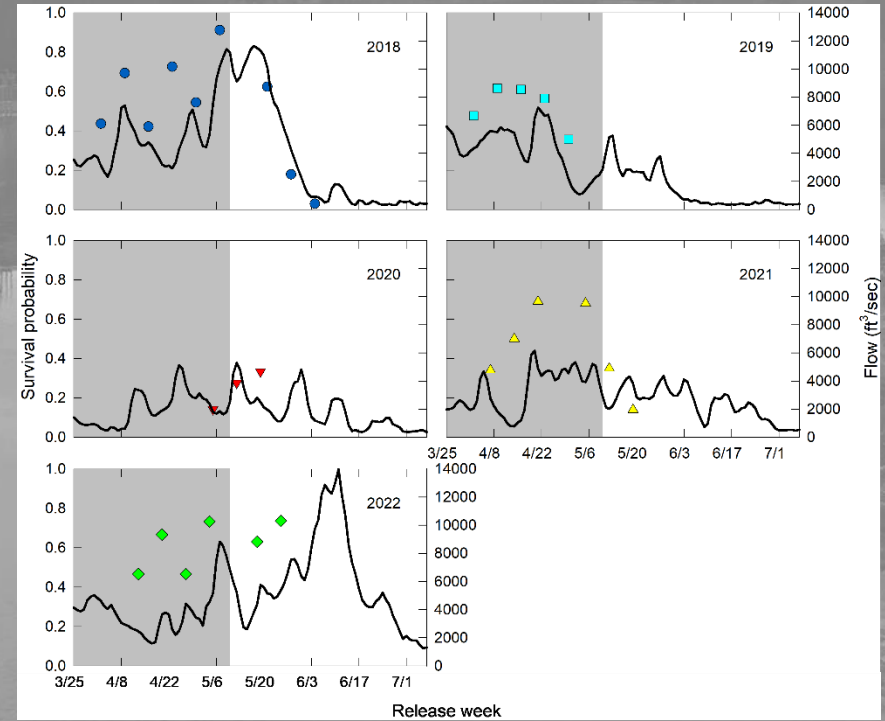
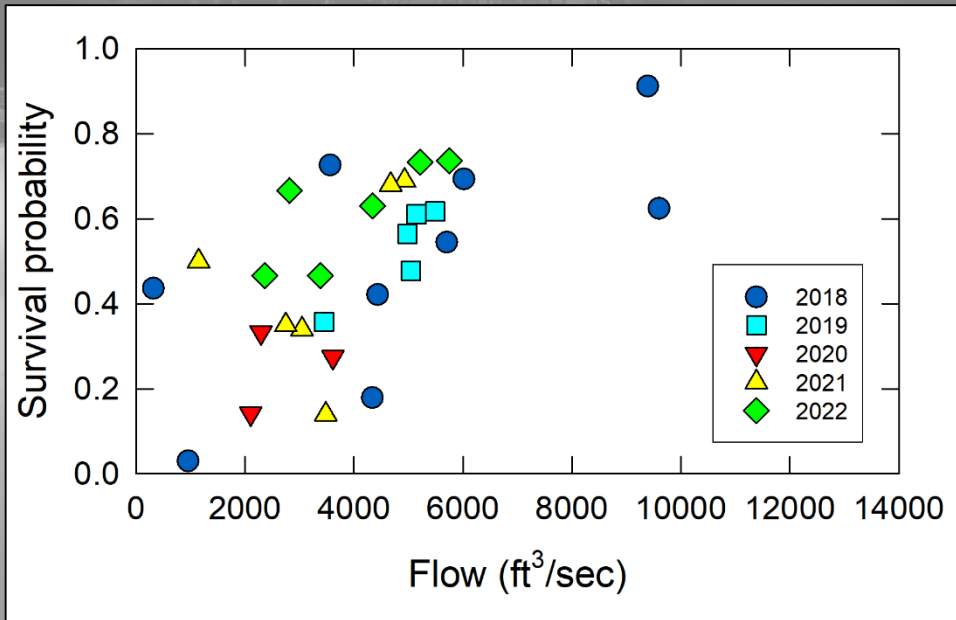
Species	2018	2019	2020	2021	2022	2023
Yearling Chinook salmon	429	590	347	200	200	199
Juvenile Steelhead	313	350	376	200	200	0
Subyearling Chinook salmon	344	393	495	390	200	377
Total =	1,086	1,333	1,218	790	600	576

Flow and Temperature



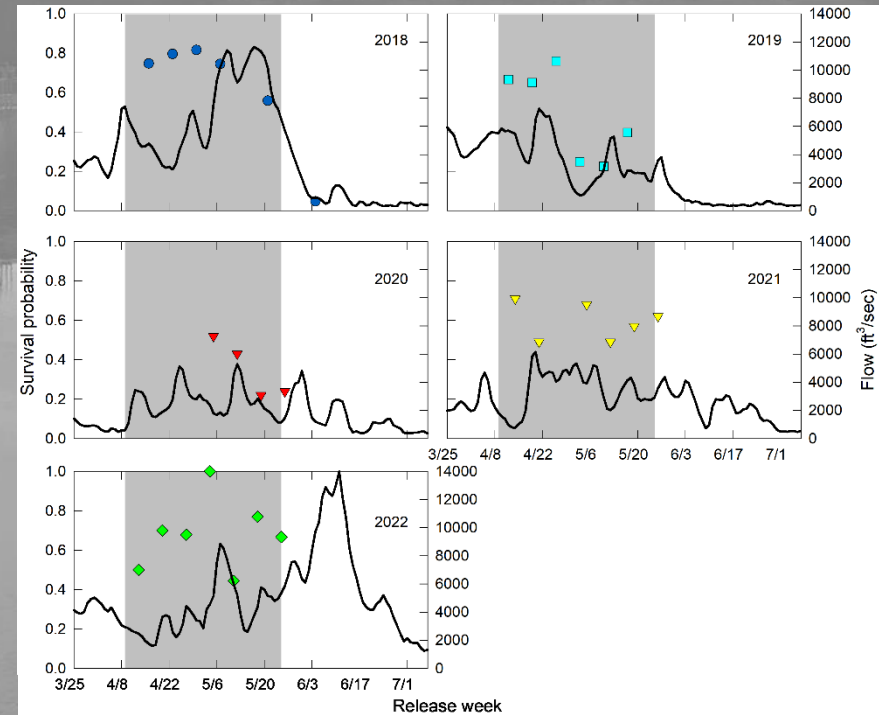
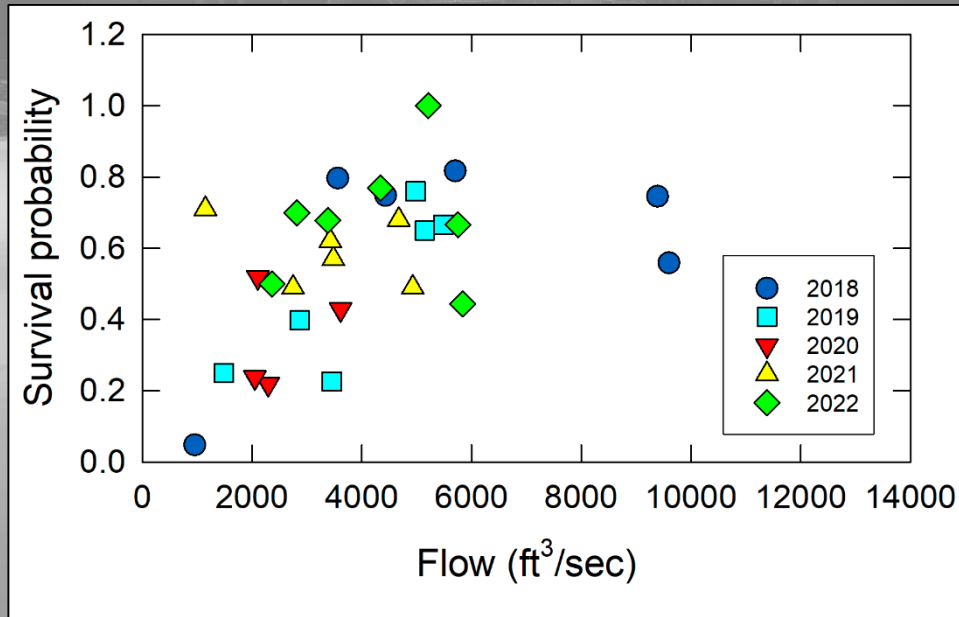
Group-Specific Survival Estimates

Yearling Chinook Salmon



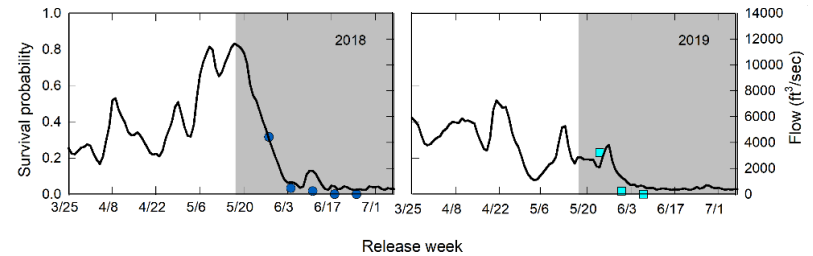
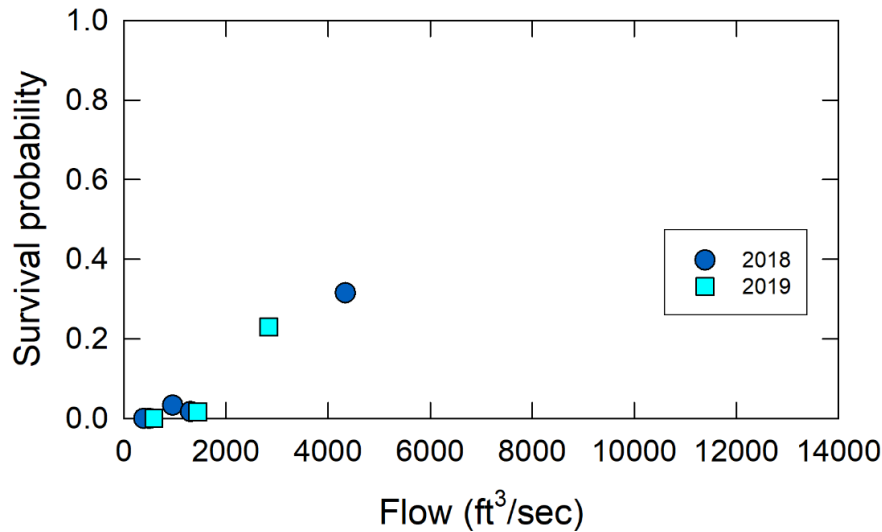
Group-Specific Survival Estimates

Juvenile Steelhead



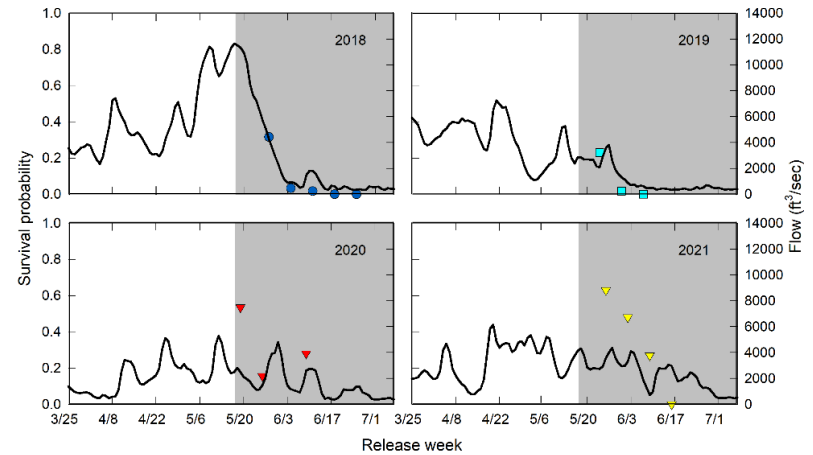
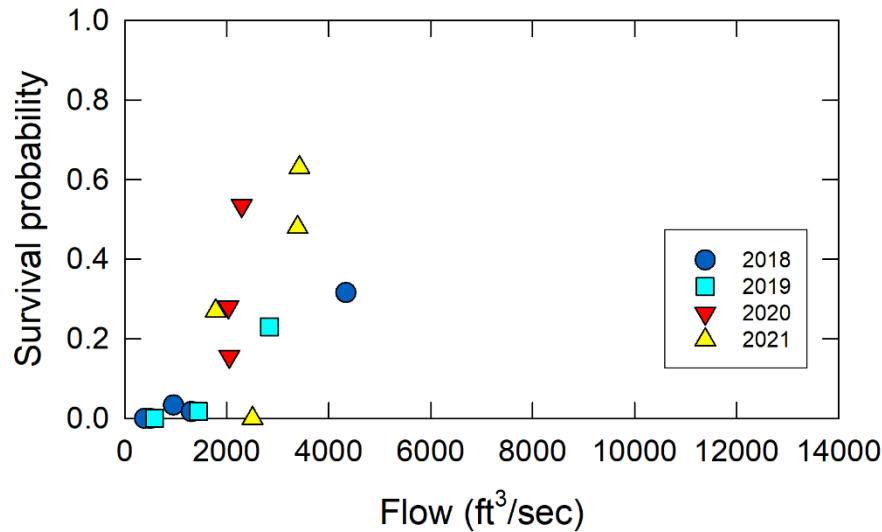
Group-Specific Survival Estimates

Subyearling Chinook Salmon



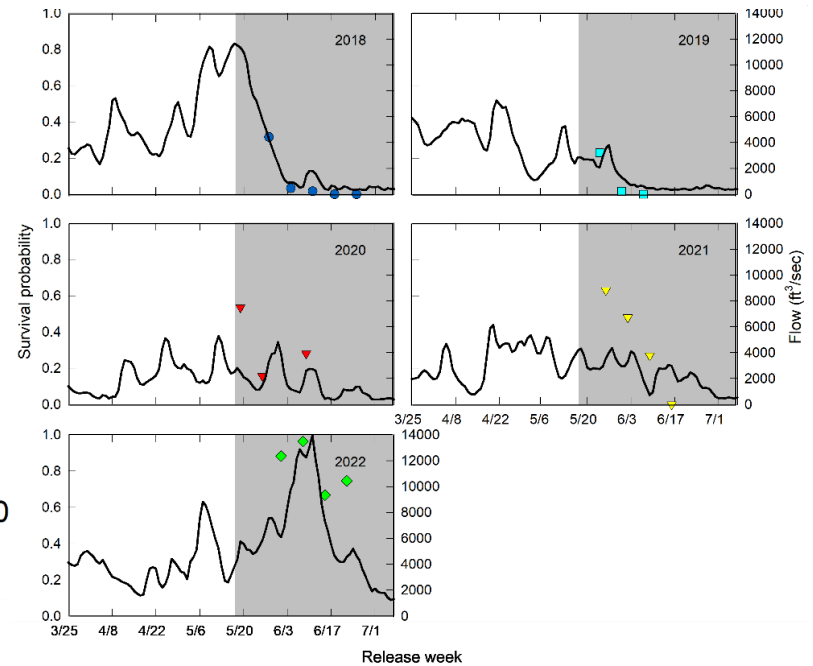
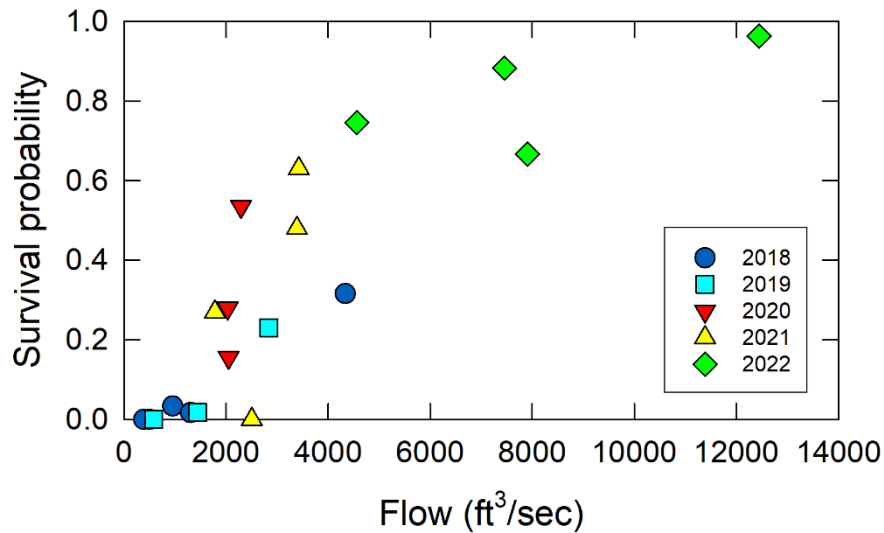
Group-Specific Survival Estimates

Subyearling Chinook Salmon



Group-Specific Survival Estimates

Subyearling Chinook Salmon

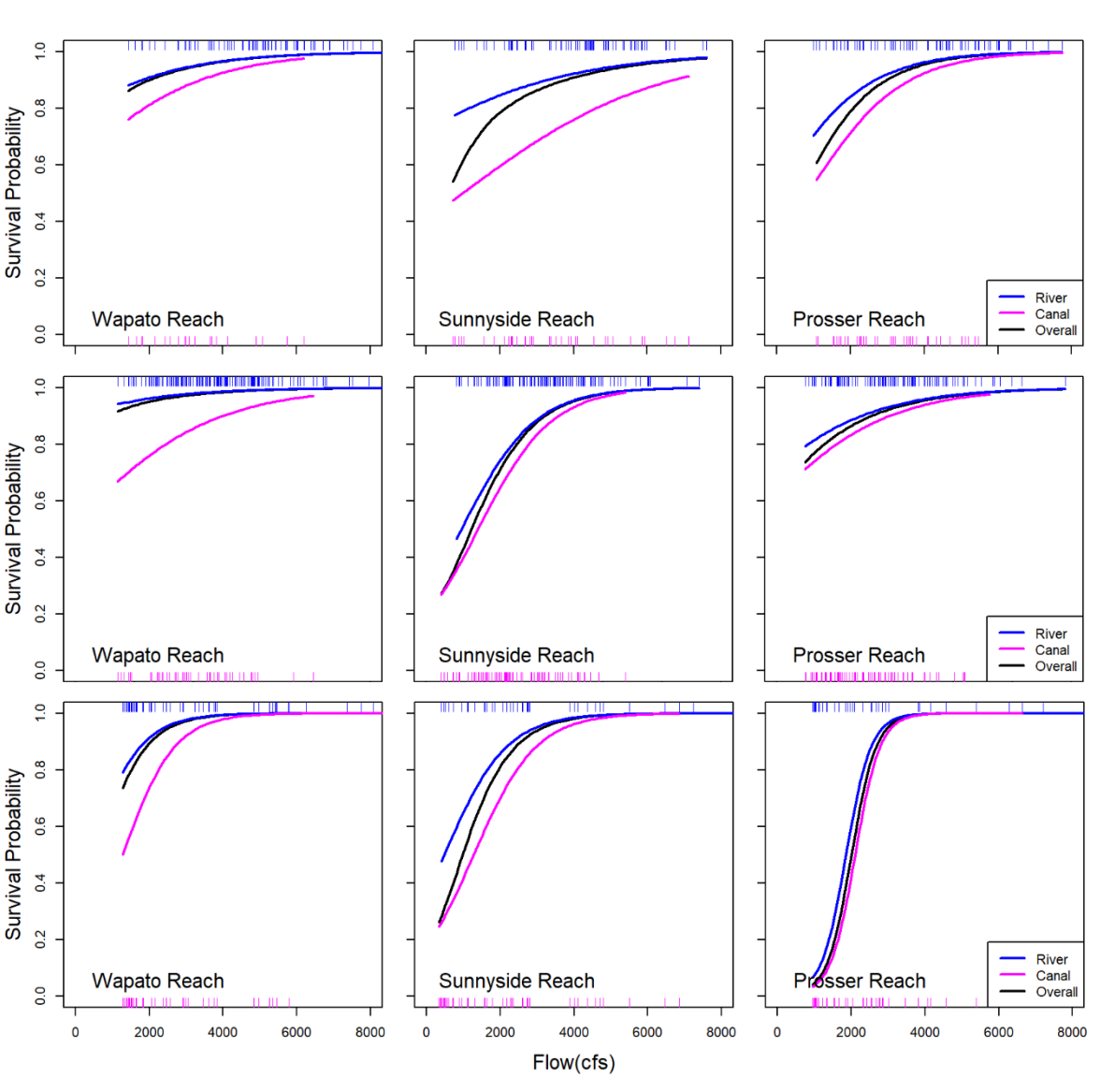


Survival and Flow

Yearling Chinook salmon

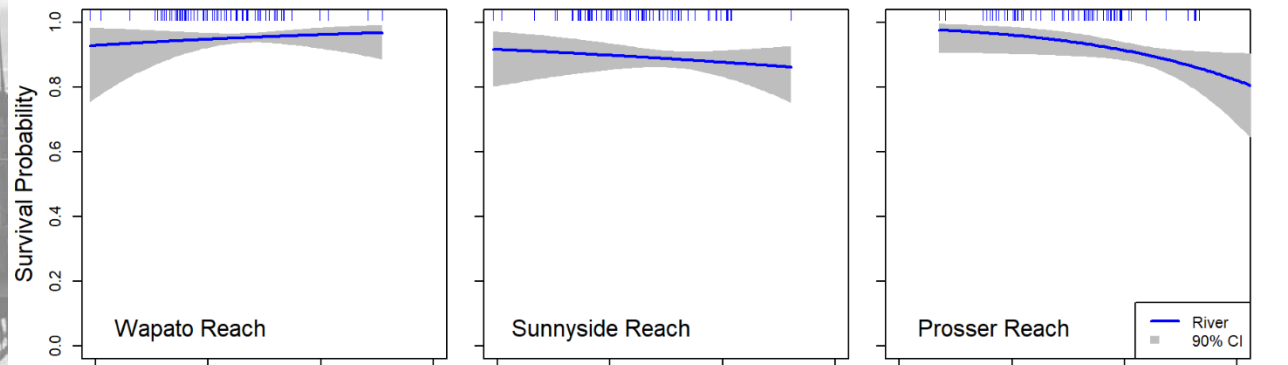
Juvenile steelhead

Subyearling Chinook salmon

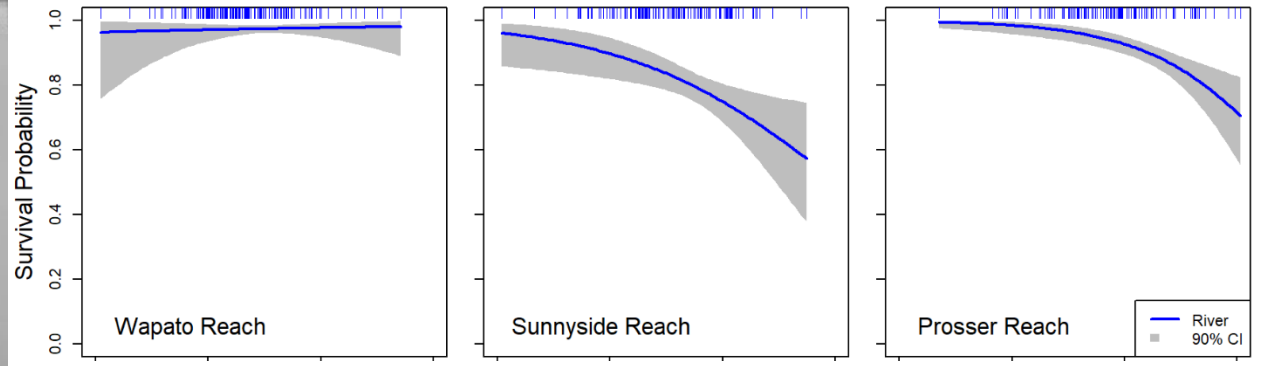


Survival and Water Temperature

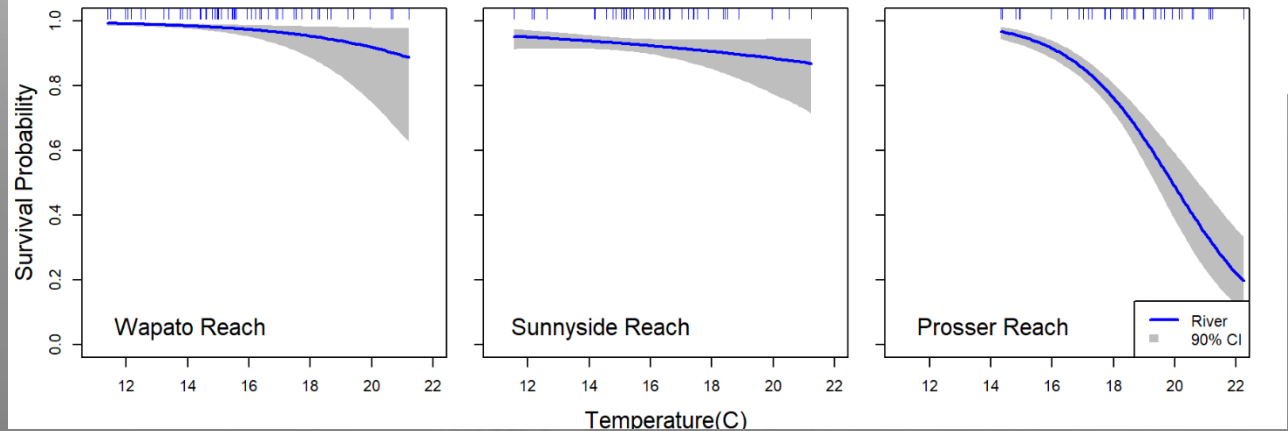
Yearling Chinook salmon



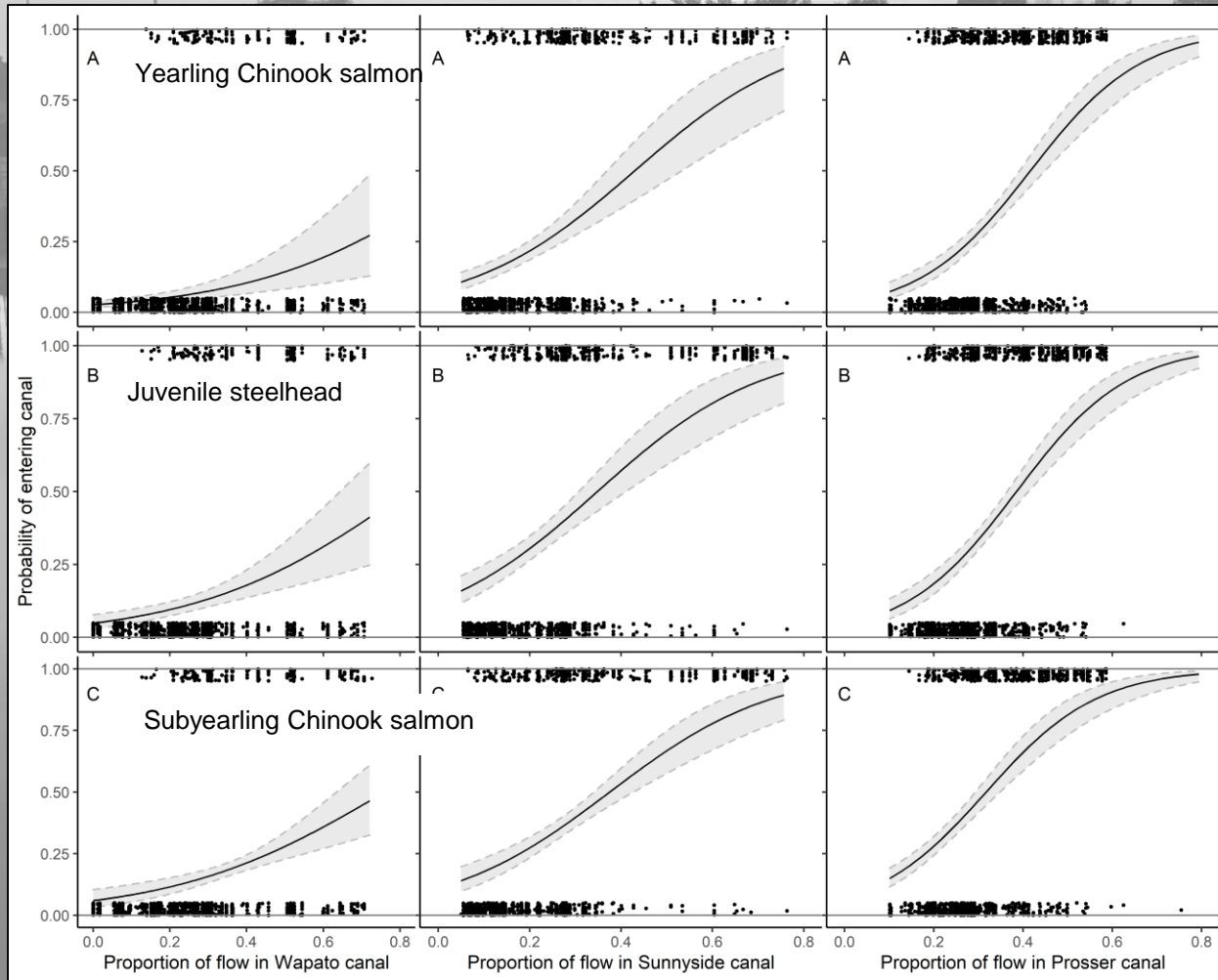
Juvenile steelhead



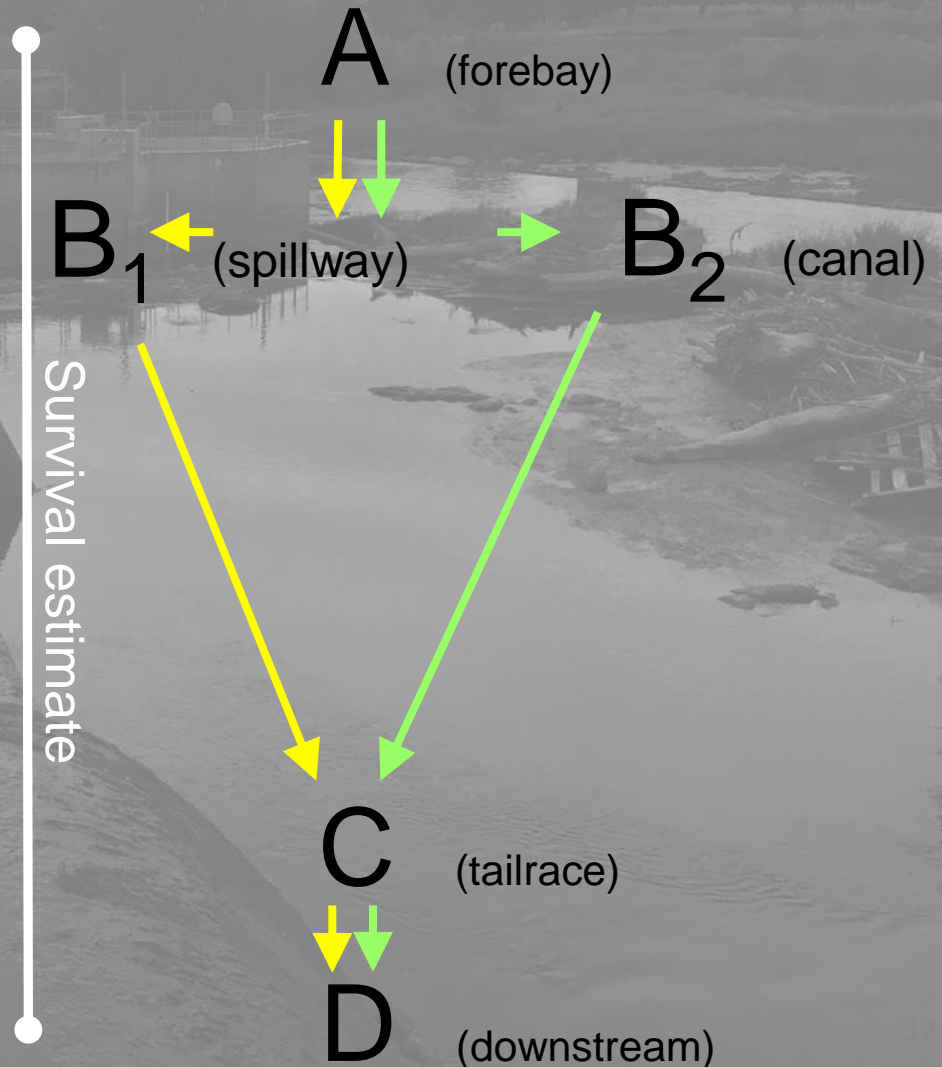
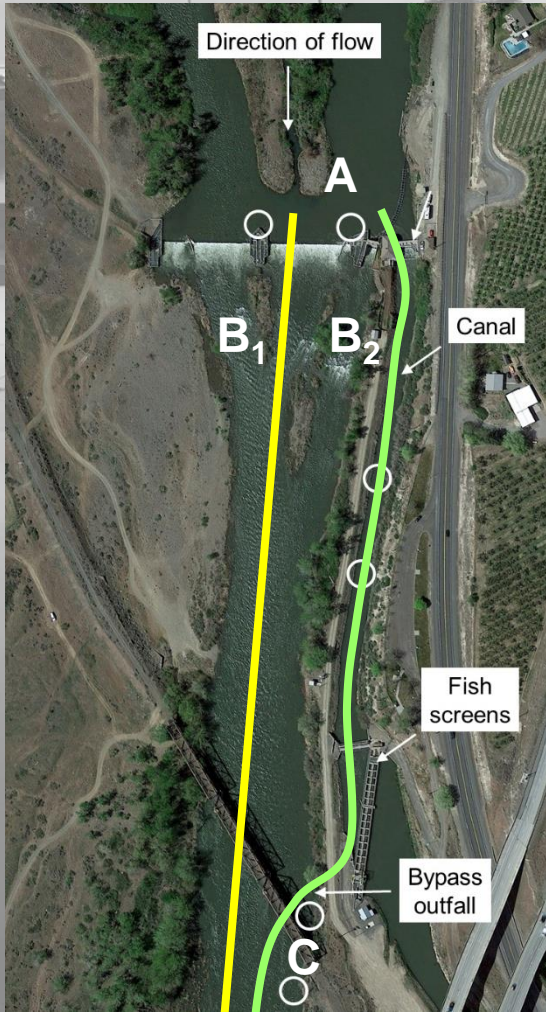
Subyearling Chinook salmon



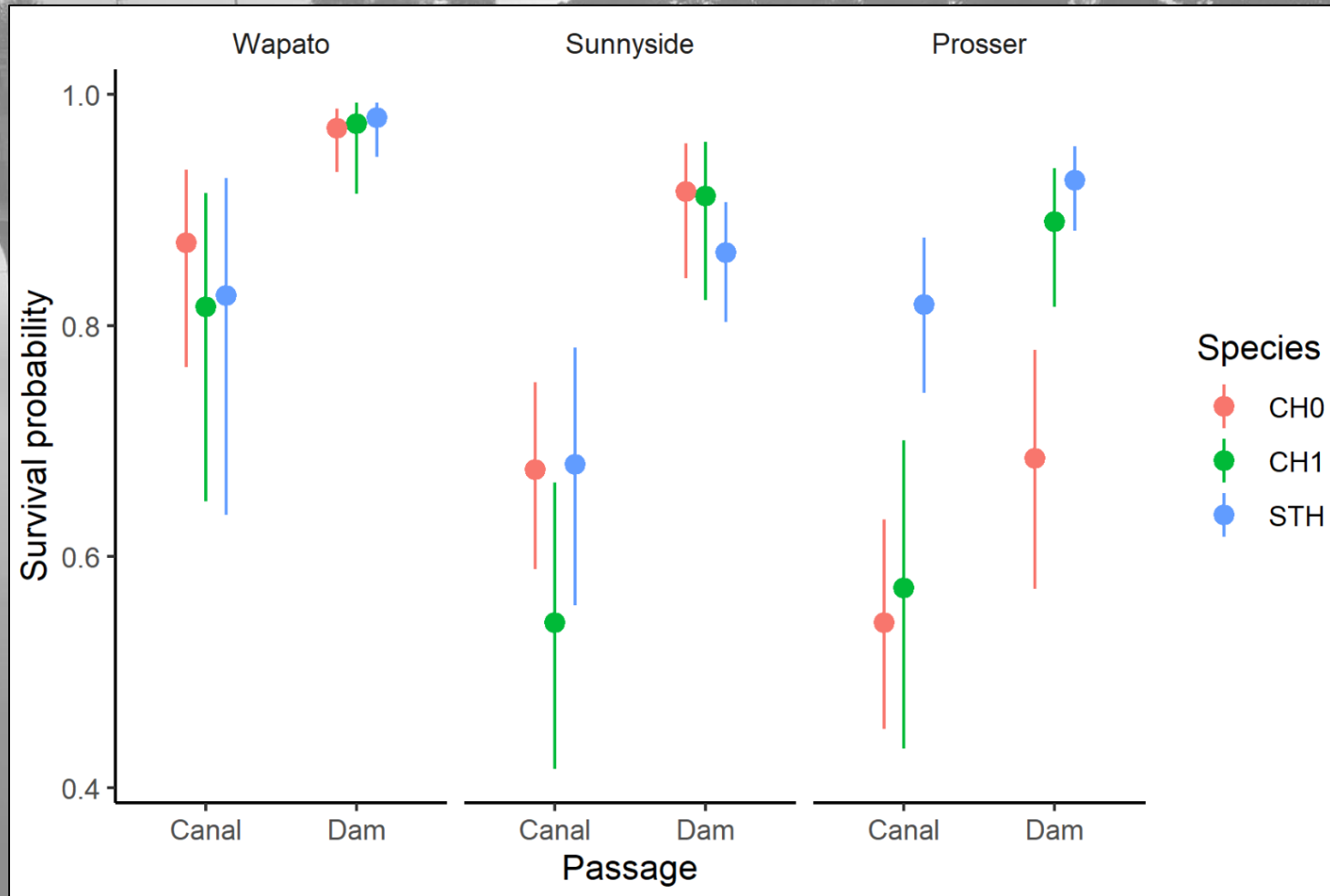
Canal Entrainment Probabilities



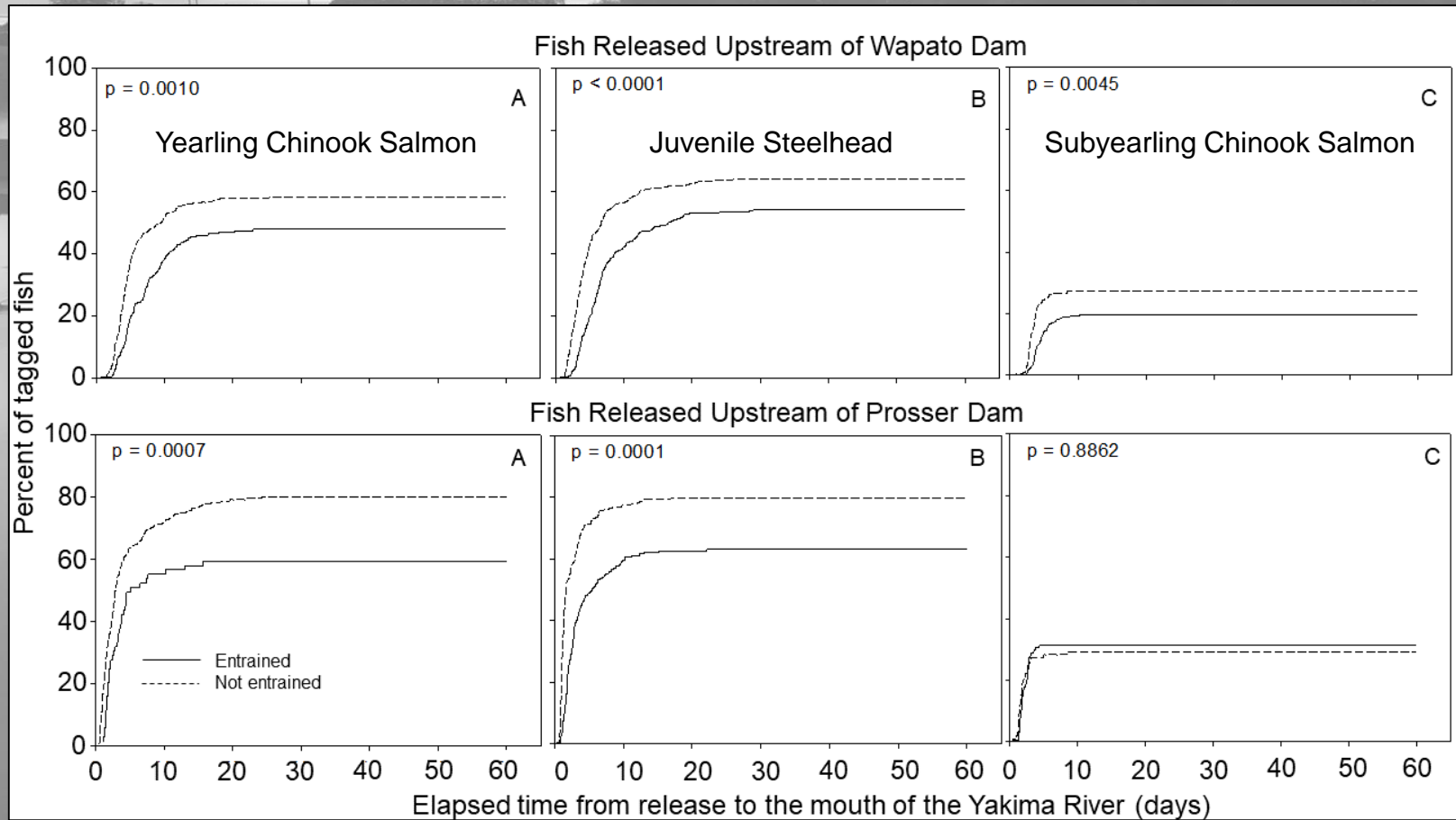
Route-Specific Survival



Route-Specific Survival



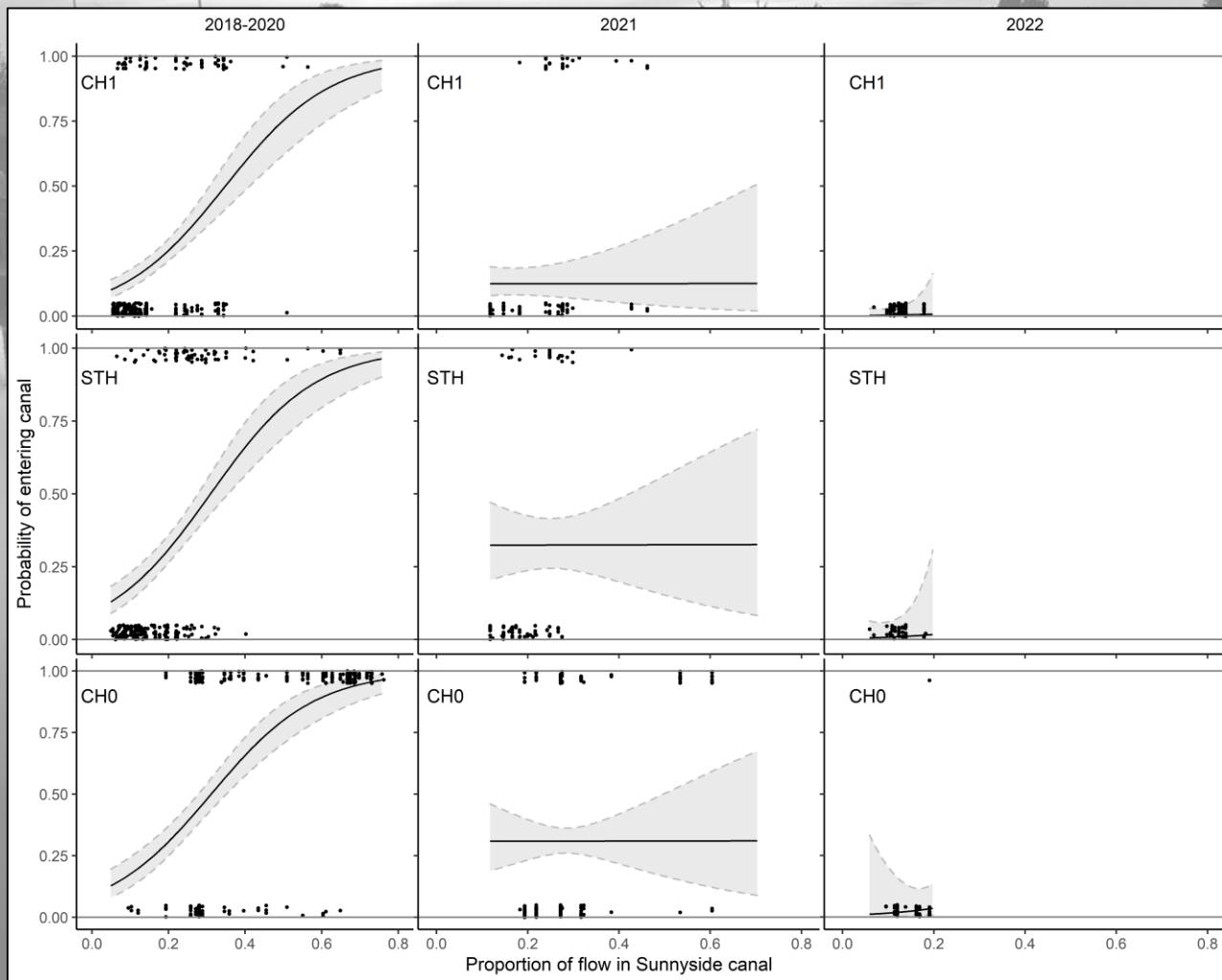
Travel Times and Overall Survival



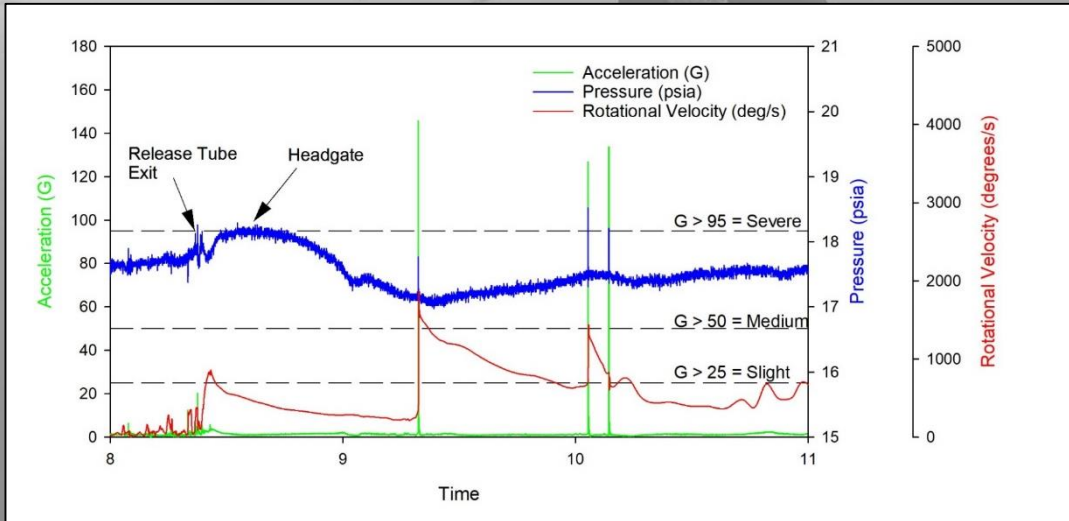
Sunnyside Dam Guidance Boom



Sunnyside Dam Guidance Boom



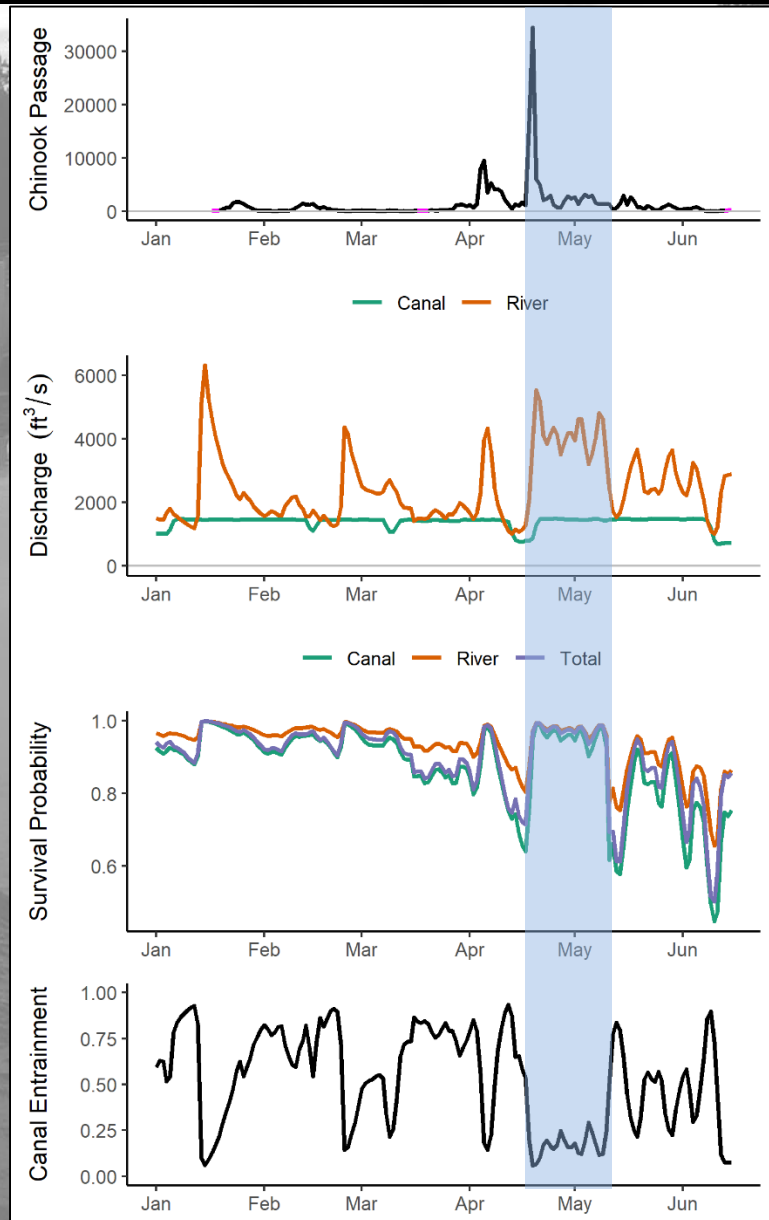
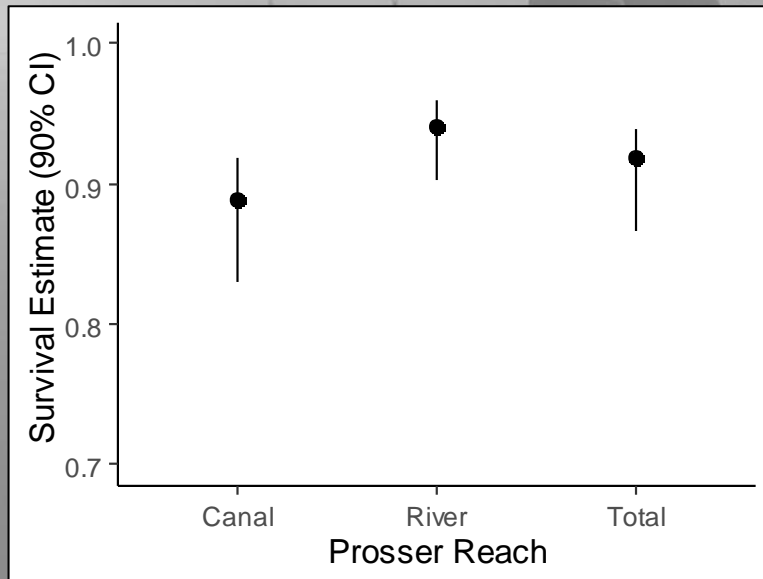
Headgate Conditions at Prosser Dam



Date	Gate opening	Canal flow	# of trials	# severe hits
Feb. 14	3.7 ft	1,426 ft ³ /s	6	0
May 11	3.1 ft	1,472 ft ³ /s	12	9
June 10	2.6 ft	1,449 ft ³ /s	9	7

Modeling Cumulative Survival

- Wild yearling Chinook salmon (2021)
- Prosser Dam
- April 18 to May 15
 - 52% of population passed
 - High flow, low entrainment, high survival
- Run size ~ 205,000 fish
- Entrainment: ~68,000 fish



Summary

- Large, multi-year study
 - Significant financial commitment
 - Participation from multiple partners
 - Many new insights now available
- Additional modeling efforts
 - Air temperature/water temperature
 - Run timing
 - Decision support
 - Predation
- 2023 studies underway