Cowlitz Falls downstream adaptive management program: history and progress

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April 16th, 2025

Outline

- Adaptive management program and CFNSC intro
- Passage performance metrics
- Adaptive management timeline
- Results of previous AMP investigations
- Upcoming FPS/FCE investigation

Cowlitz Project Adaptive Management Plan

- **Draft Adaptive Management Plan (DAMP) completed in 2014**

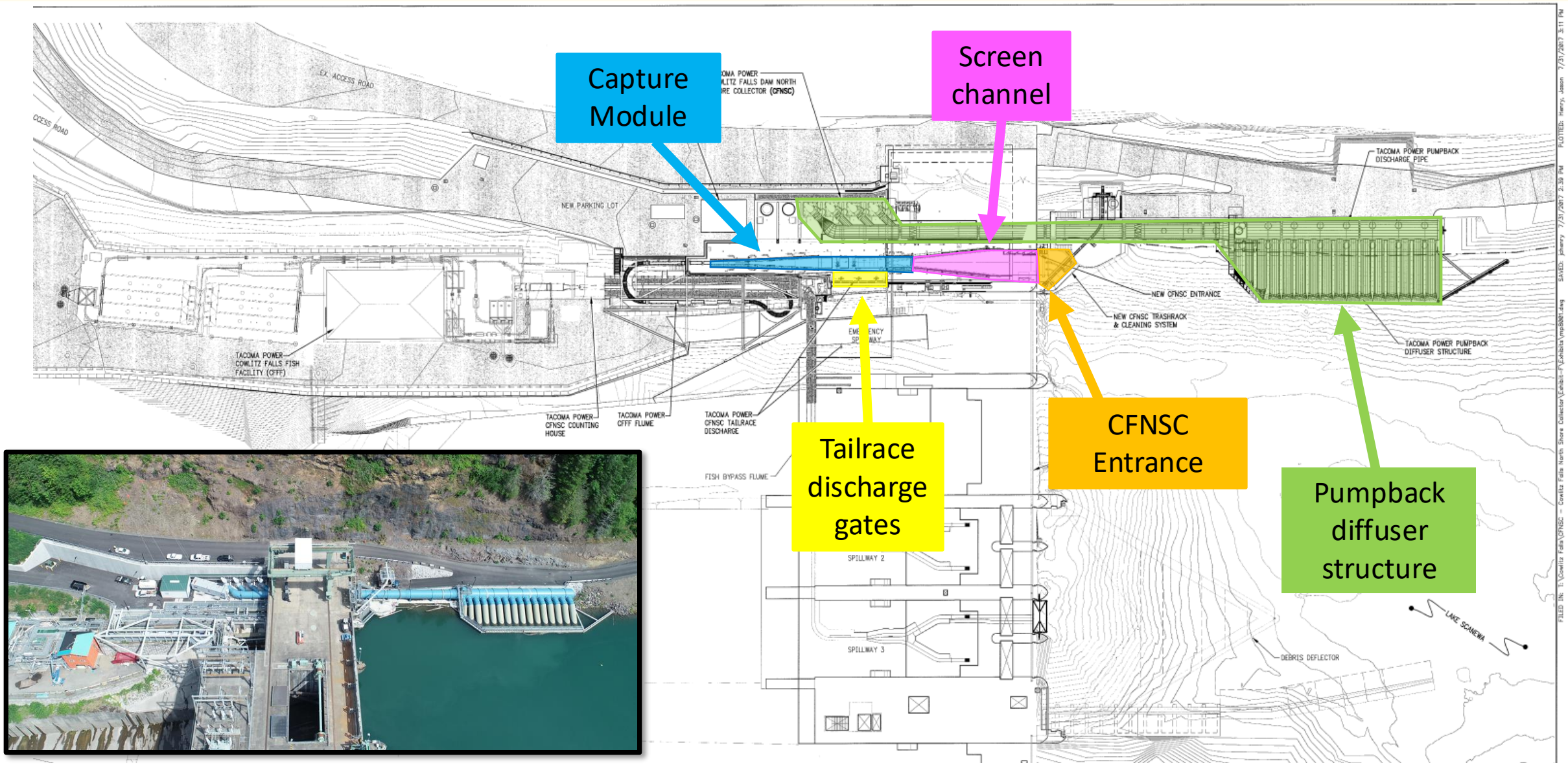
- **Two phases:**

  - Phase 1: Before CFNSC construction
    - Complete design, permitting, and construction
    - Interim CF collector
    - Prototype weir box at CF spillway 3 tested for feasibility

  - Phase 2: After CFNSC construction
    - Develop performance metrics for evaluation
    - Develop monitoring techniques
    - Based on these, develop framework for optimization
    - **Facilitate rapid improvements through data-driven corrective actions**

Pre-CFNSC juvenile collector, CF forebay

Key features for adaptive management



CFNSC Construction

Construction was completed in 2017

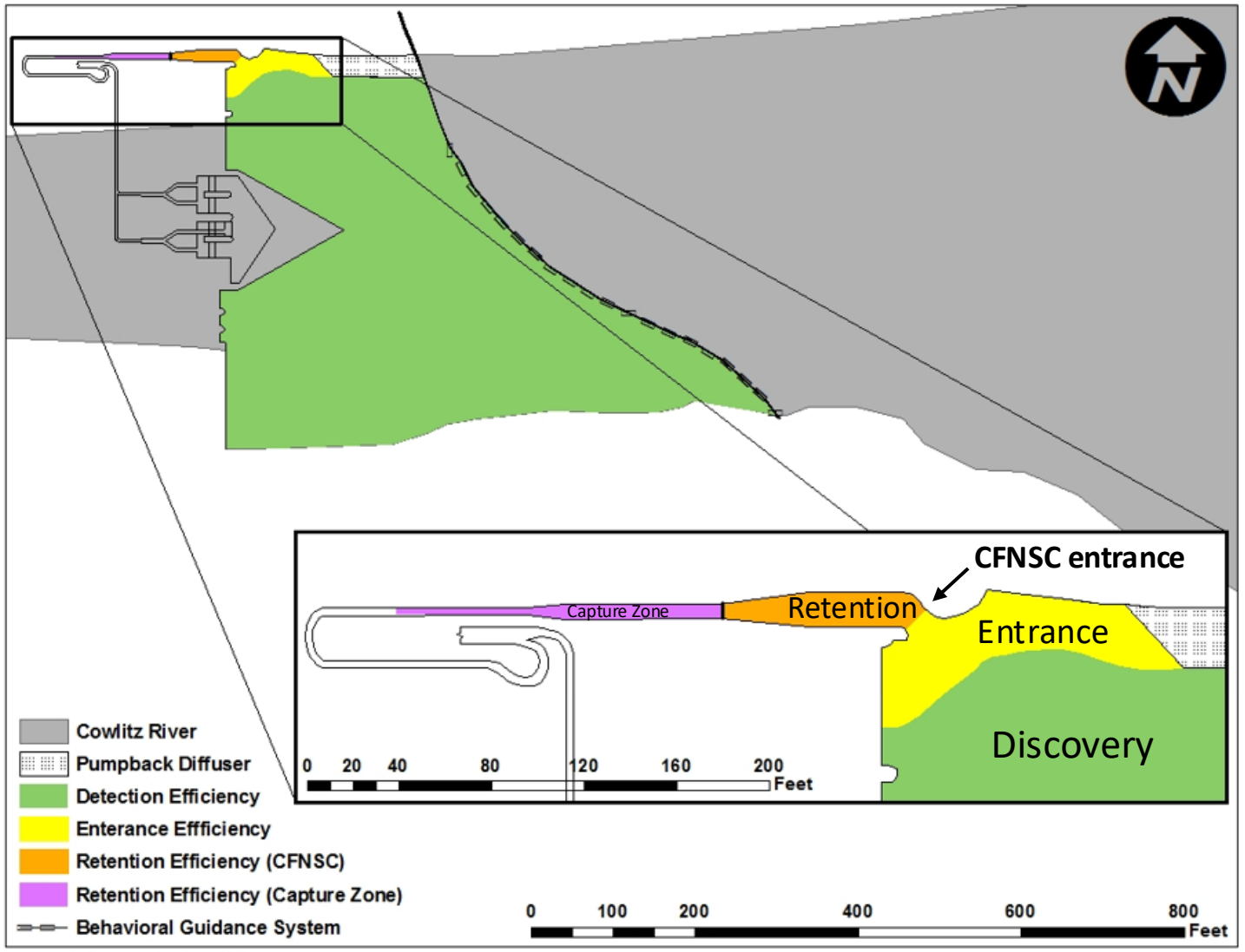
CFNSC looking upstream

Present location of PDS

FCE at Cowlitz Falls

Collection efficiency metrics:

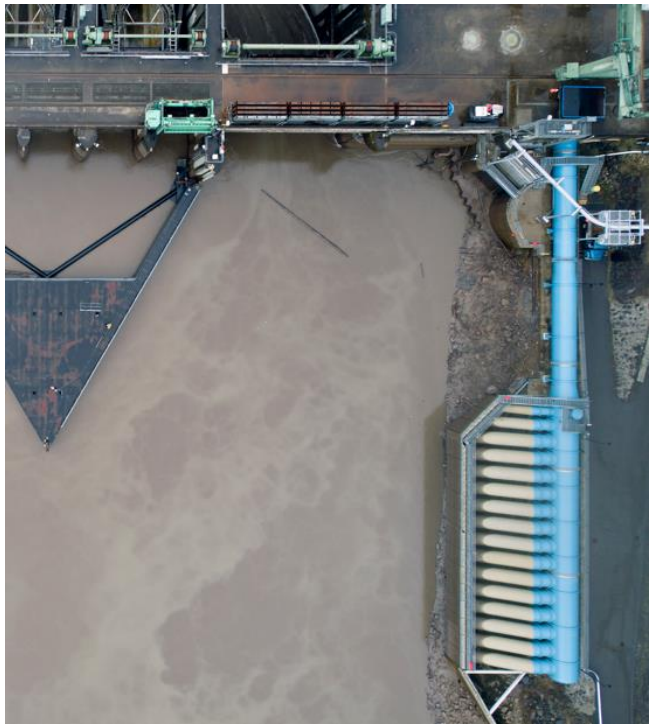
- Detection (“discovery”) efficiency
- Entrance efficiency
- Retention efficiency
- Capture zone efficiency



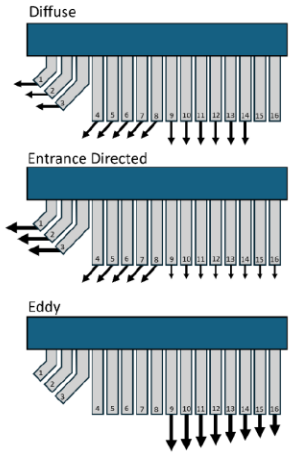
Available adjustments to optimize FCE

What physical facility modifications do we have available to us?

Forebay hydraulics via PDS

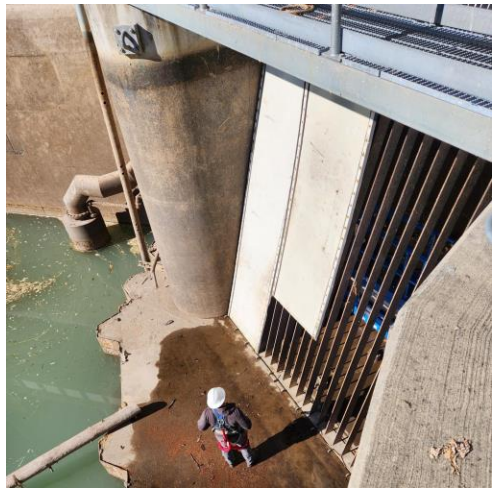


3 settings identified and tested



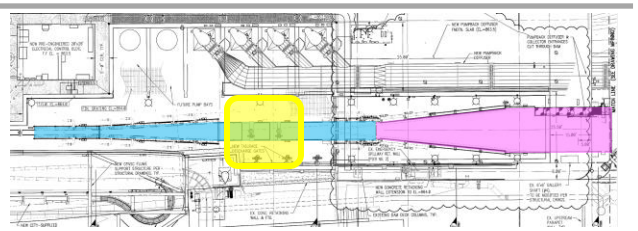
CFNSC entrance velocity modification

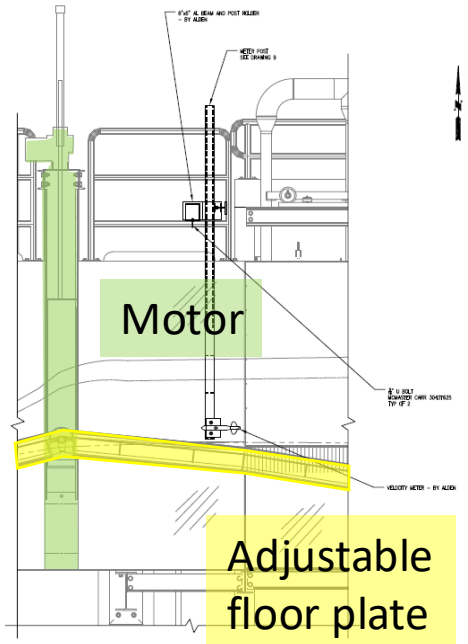
Occlusion Plates



Increase CFNSC inflow to 750cfs (discharge 250cfs to tailrace)

Capture zone floor geometry





Adjustments to optimize efficiency metrics

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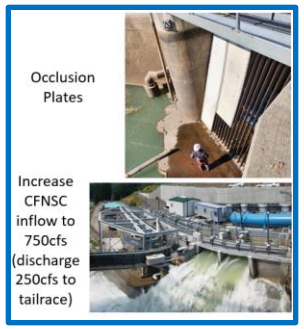
TACOMA PUBLIC UTILITIES

Retention efficiency:
- Entrance velocity
- Capture zone floor geometry



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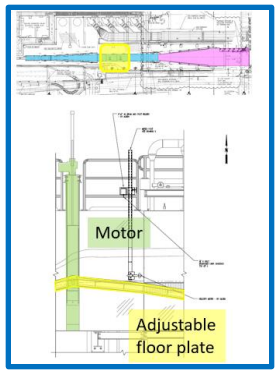
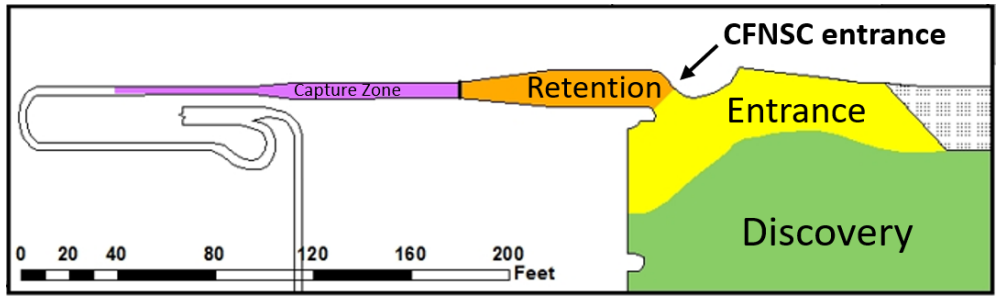
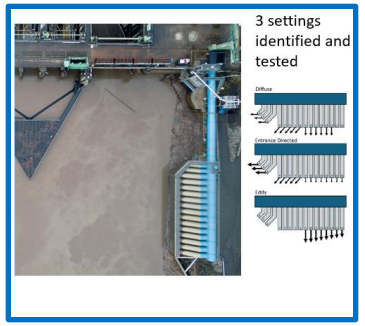




Entrance efficiency:
- PDS setting
- Entrance velocity



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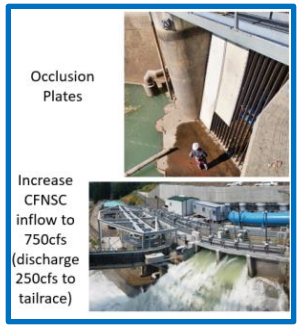
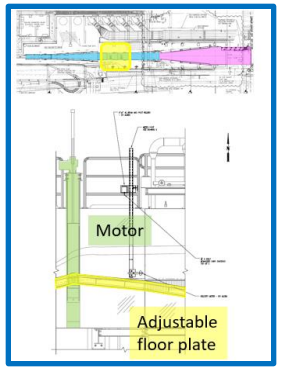
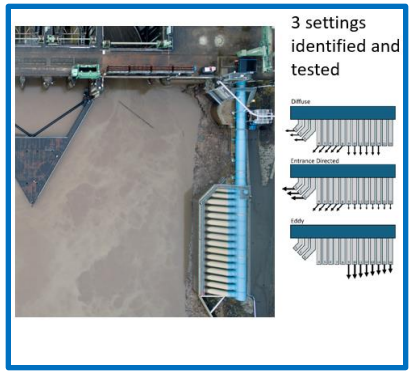


Capture zone efficiency:
- Capture zone floor geometry



Discovery efficiency:
- PDS setting



Planned Adaptive Management Responses

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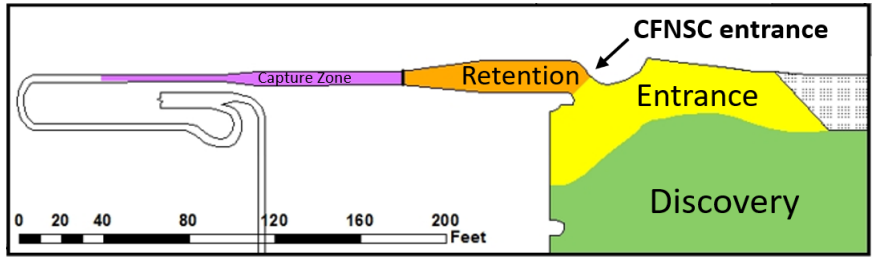
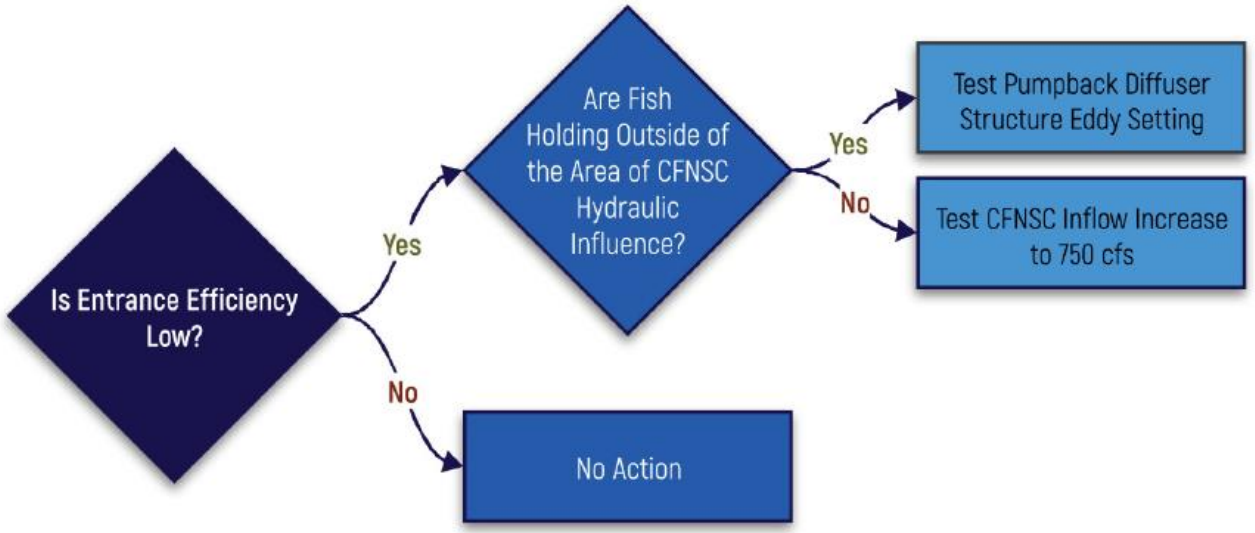
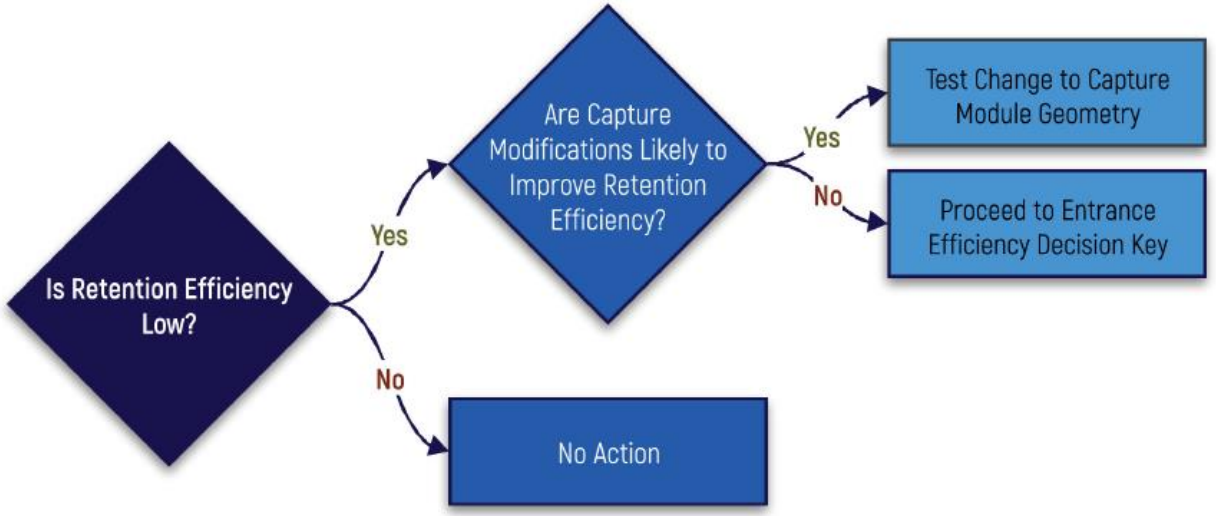
Entrance efficiency

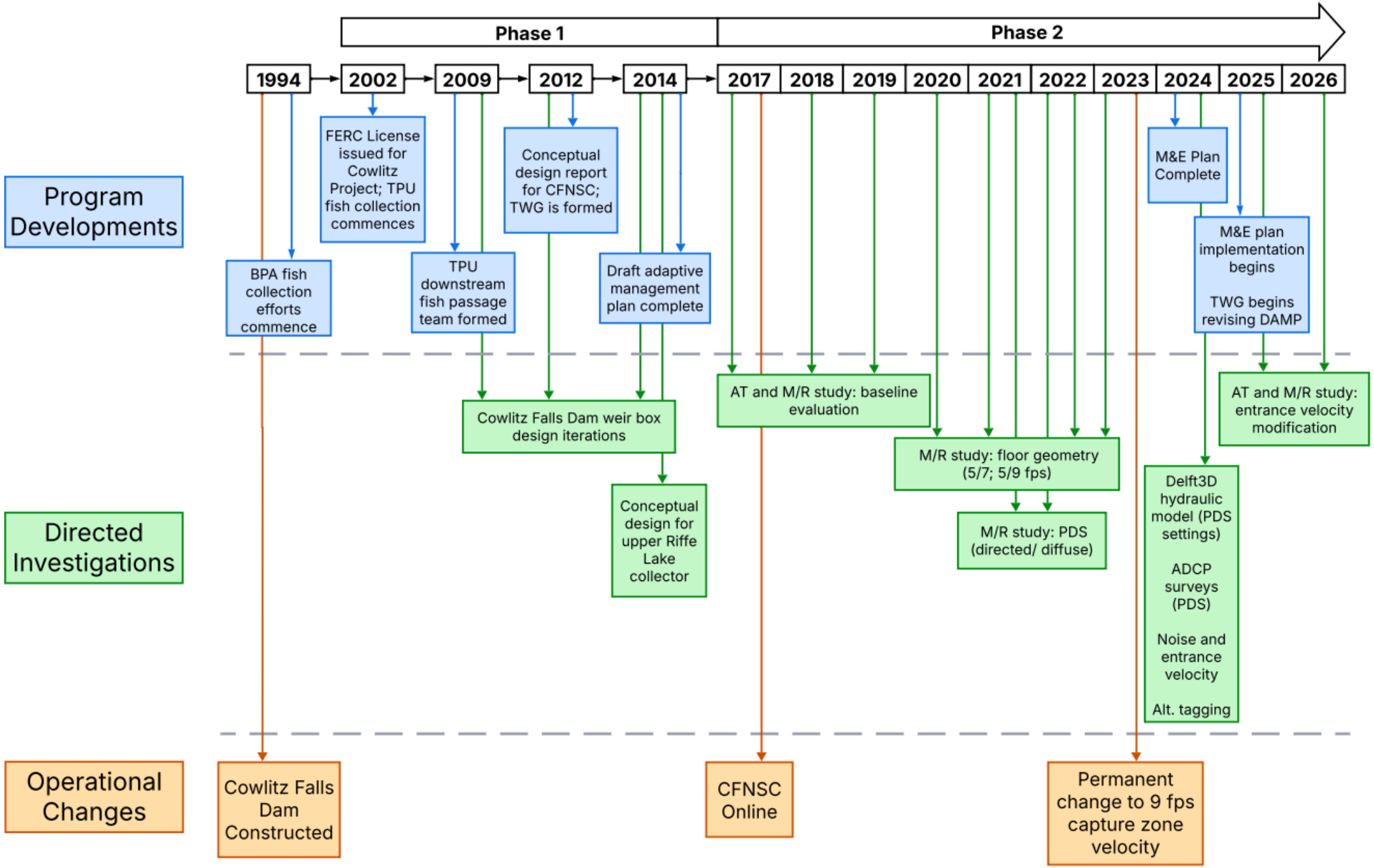




Retention efficiency



Adaptive Management Timeline



Key findings: 2017 – 2019

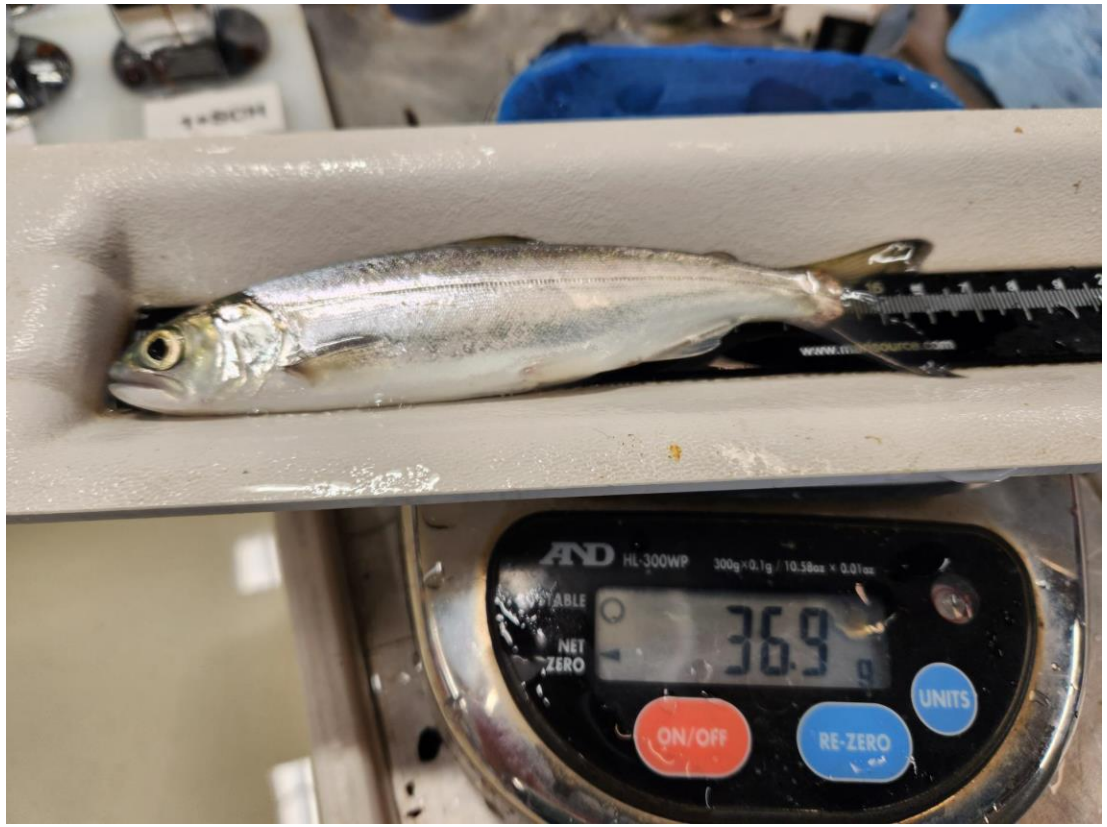
- **Acoustic telemetry studies on Chinook/steelhead FCE components**
  - Low entrance efficiency for Chinook across years.
  - Low retention and capture efficiency for steelhead in 2019.

Year	Species	Detection Efficiency	Entrance Efficiency	Retention Efficiency	Capture Zone Efficiency
2017	Chinook Salmon	99.6%	70.7%*	93.0%	96.8%
2018	Chinook Salmon	98.1%	81.6%*	88.8%	99.0%
2019	Chinook Salmon	100%	75.1%*	96.4%	96.4%
2019	Steelhead	100%	96.5%	80.0%*	81.4%*

Note: Asterisk and gold coloring indicates lowest efficiency metrics each year.

Key findings: 2017 – 2019

- **Chinook residence times in the forebay increased throughout migration season**
- **Juvenile salmonids tend to congregate in top 2 m of water column**
- **Greater Chinook dispersal in ZOI under unit 1 vs. unit 2 ops**



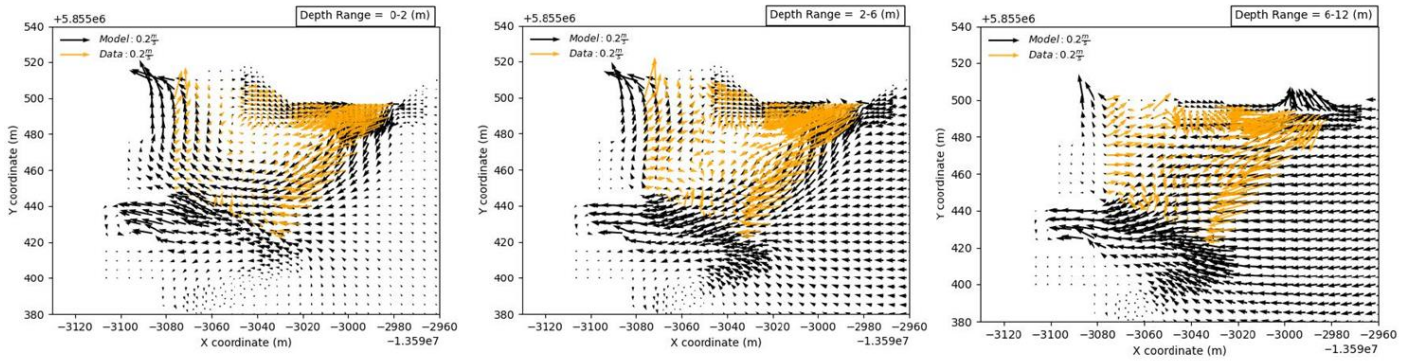
Key findings: 2020 - 2023

- **Capture module floor geometry (2020 – 2023)**
  - M/R studies prompted by low retention/capture efficiency for steelhead
  - 2020, 2021: alternating 5/7fps treatments at up/downstream ends of capture module showed no effect.
  - 2022, 2023: a 9/9fps treatment outperformed 7/5fps.
  - **2023: permanent shift to 9/9fps configuration**.
- **Chinook FCE as a function of PDS setting (2021 – 2022)**
  - M/R showed no significant difference in FCE between diffuse and directed. Eddy not tested.

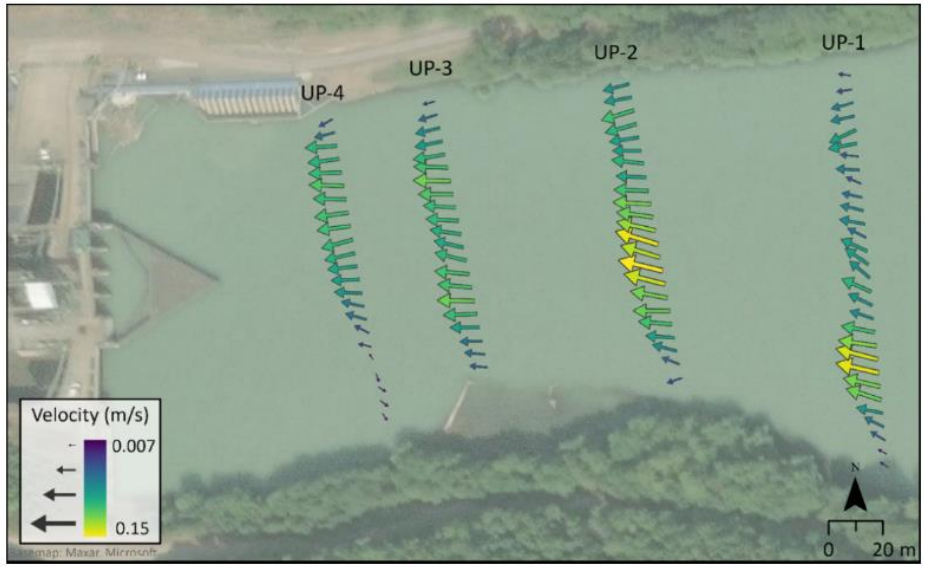
Modeling and surveys in 2024

- **Delft3D hydraulic model**
  - Variable turbine units (#1 or #2)
  - Variable PDS settings
    - Diffuse
    - Entrance directed
    - Eddy

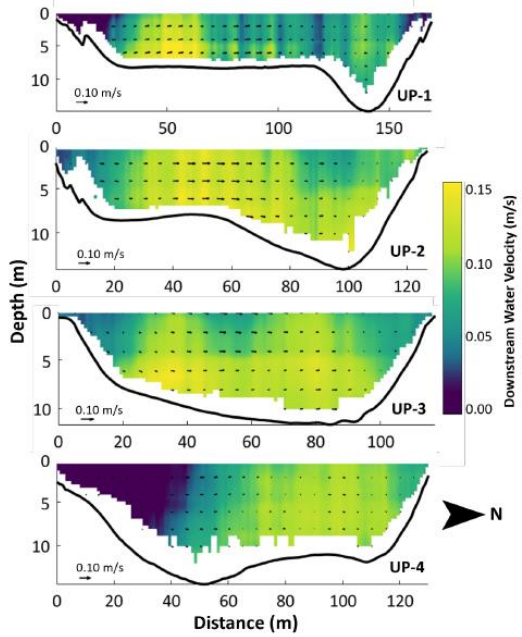
Eddy-U1 Configuration



- **Acoustic doppler current profiler (ADCP) surveys**
  - Cross sections of velocity
  - Transects in ZOI for interpolation
  - 3D hydraulic model validation

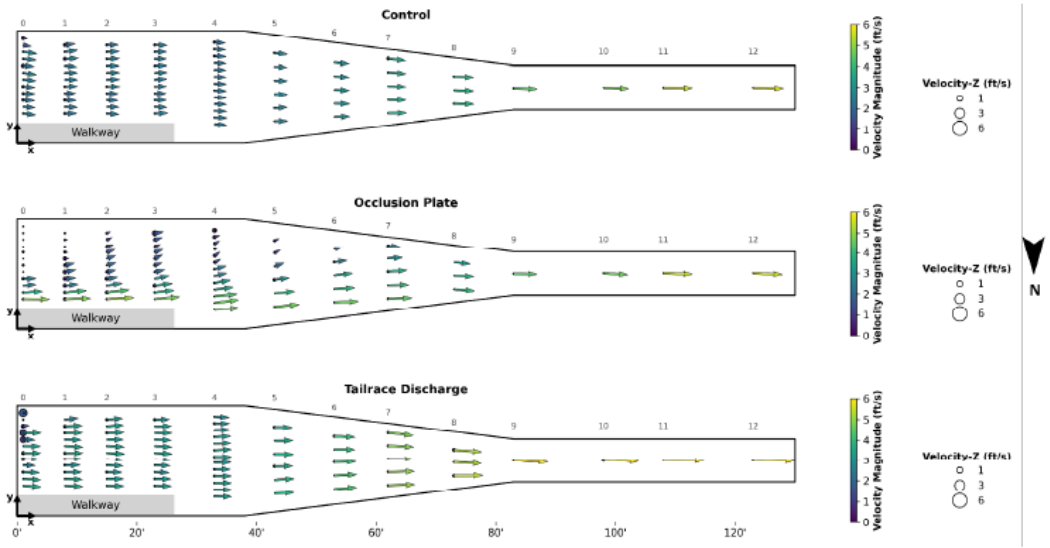


Looking downstream:



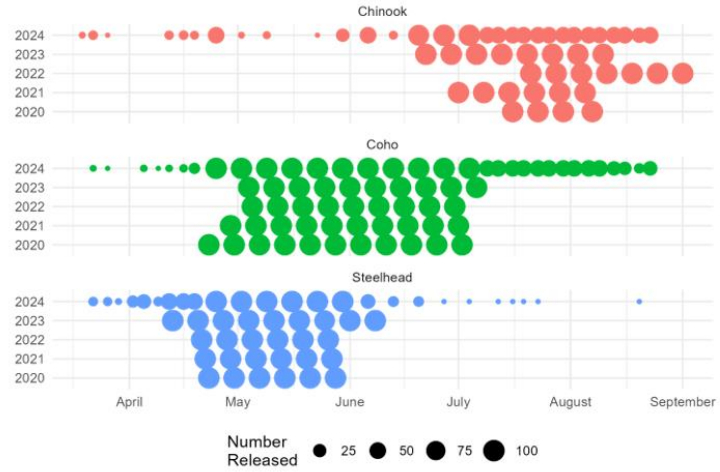
Modeling and surveys in 2024

- **CFNSC velocity and noise surveys**
  - Tested 3 entrance configuration treatments
  - Doppler velocimeter for fine scale velocities inside collector
  - Hydrophone for noise monitoring



Doppler velocimeter results

- **Alternative tagging strategy for FCE evaluations**
  - Changing release group size and frequency
  - More on this later from John Best (WDFW)

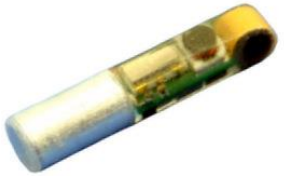


FCE release groups

CFNSC entrance investigation: 2025 - 2026

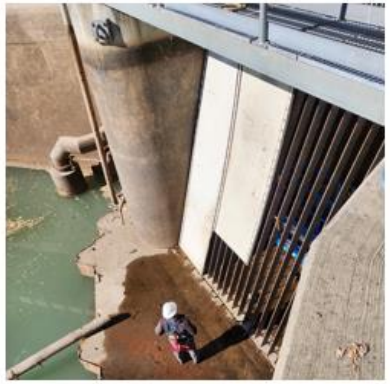
- **Acoustic telemetry study planned for 2025 and 2026**
- **Quantifying ZOI behavior and FCE as a function of:**
  1. Control
  2. Occlusion Plate
  3. Tailrace Discharge (750 cfs inflow)
- **Results will be interpreted in the context of past AT studies**

ATS acoustic receiver



ATS acoustic tag

Occlusion Plates



Increase CFNSC inflow to 750cfs (discharge 250cfs to tailrace)

Next steps

- Adaptive management plan revision (TWG)
- M&E plan implementation (M&E)
- Future modifications to CFNSC

Questions