Snake River Juvenile Salmon Transportation Program: An Overview of a Hydropower Mitigation Effort

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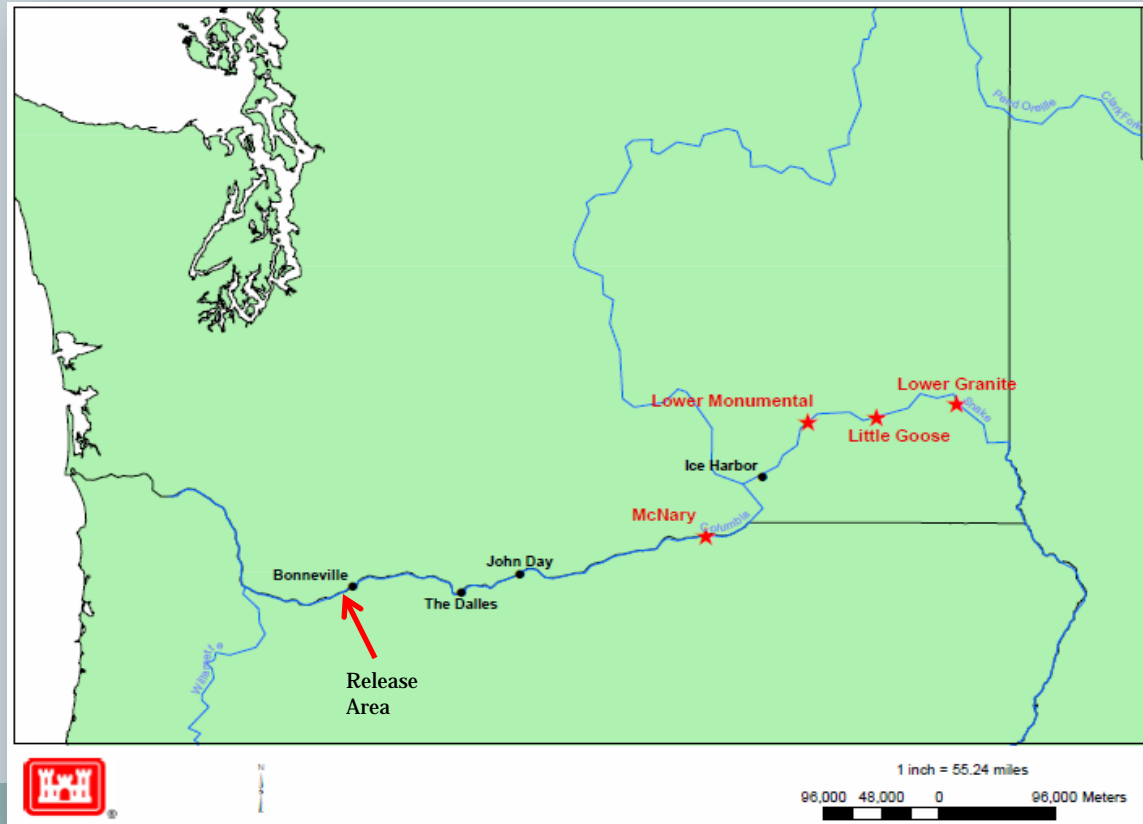# Outline

- Transportation Program Overview
- Efficacy and Adaptive Management
- Major Criticisms of the Program
- Future of juvenile salmon transportation in the Snake River basin
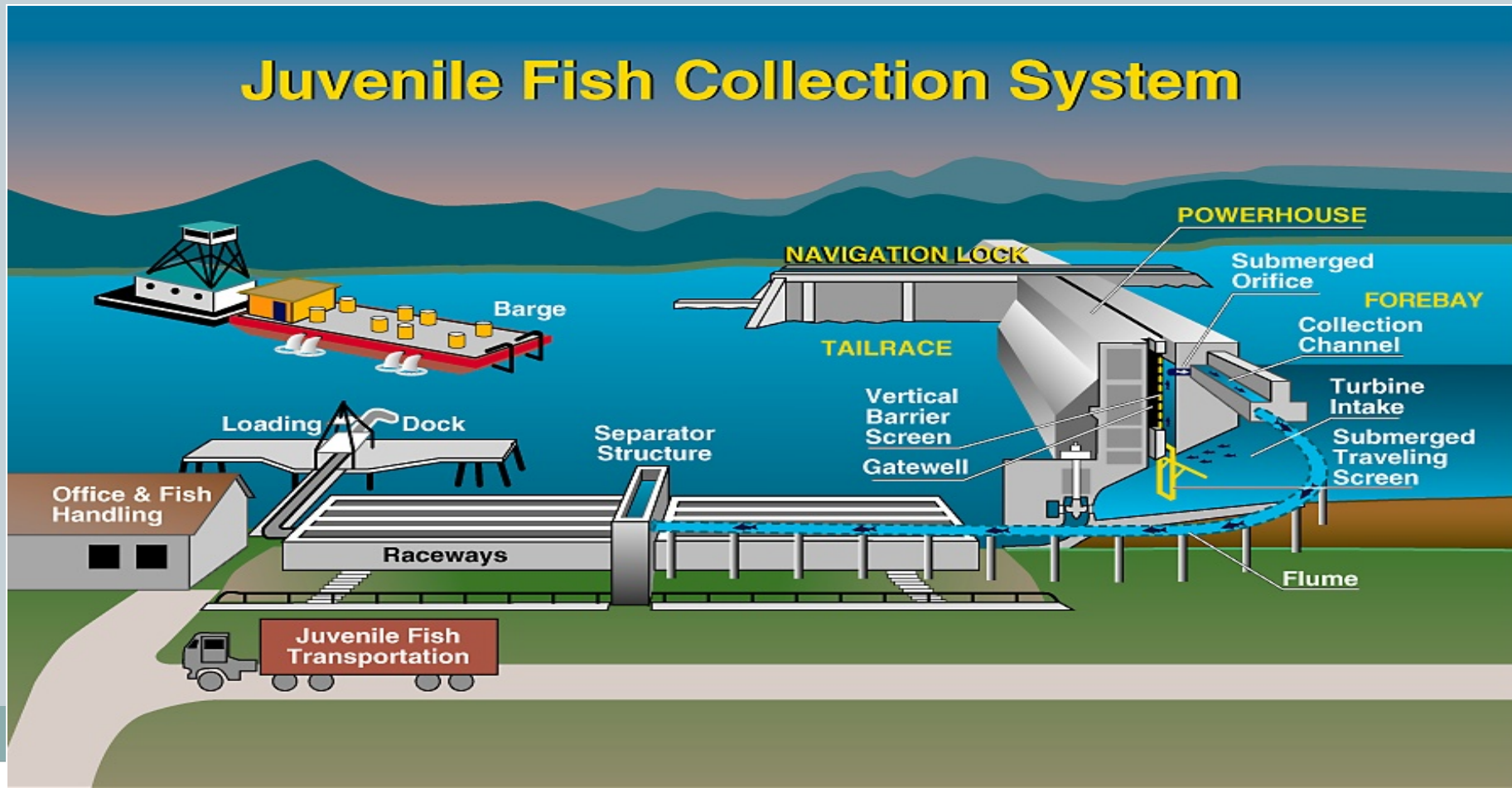
Transportation of juvenile salmonids

- Juvenile salmonids are collected and transported from 3 facilities on the Lower Snake River

Transportation of juvenile salmonids

- Fish are collected at these facilities through screened juvenile bypass systems
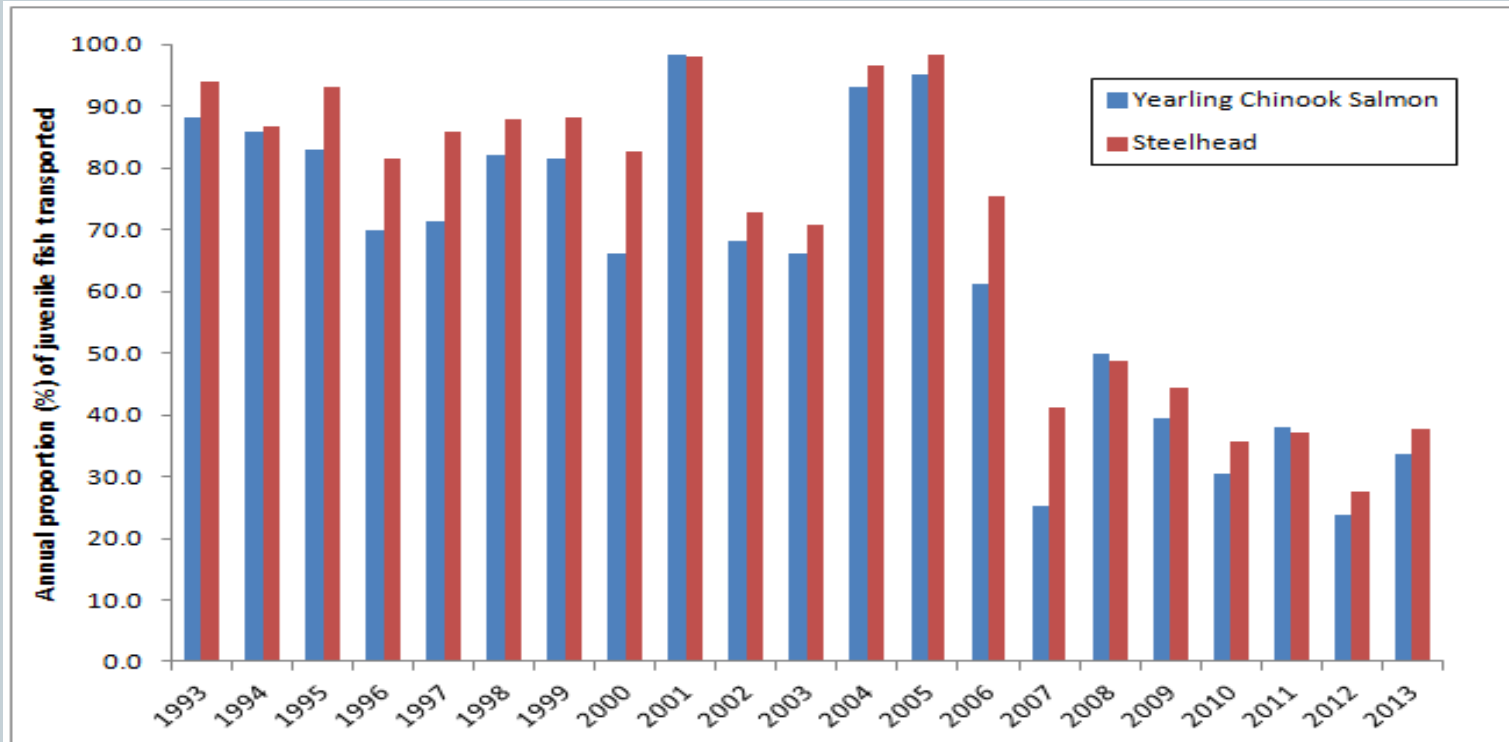
Transportation of juvenile salmonids

Transportation of juvenile salmonids

- Average of 8.4 million smolts annually transported to below Bonneville Dam

Does juvenile transport work?

- A matter of perspective – What is the goal?
  - Recovery?
  - De-listing?
  - Increased adult returns?
- How do we evaluate transport?
  - Ratio of Smolt to Adult Returns (SARs)
    - Transported vs. Bypassed (T:B)
    - Transported vs. Never Collected/Detected (T:C_0)

Does juvenile transport work?

- ## How do we evaluate transport?
  - T:B and T:C_0 ratios answer different questions
  - T:B = What to do with a collected fish
  - T:C_0 =Do we seek/avoid collection for transport

- ## Management decisions
  - Statistical significance and point estimates

- ## Annual results are variable, however, it consistently produces a survival advantage

Recent Results

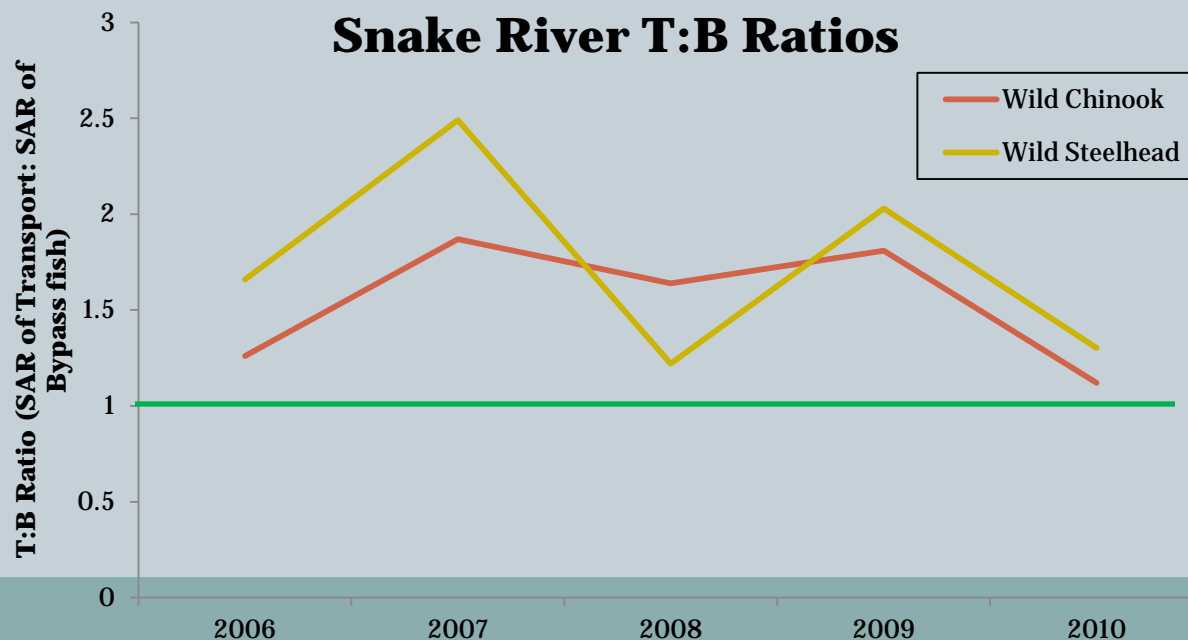- (*Lag in results, waiting for adult returns)

Geometric Mean Transport Ratios from Lower Granite Dam for Snake River Wild and Hatchery Spring/Summer Chinook Salmon (2006 through 2010)

Species	T:C_0 Ratio (90% CI)	T:B Ratio (90% CI)
Wild Chinook salmon	1.04 (0.90 – 1.13)	1.38 (1.23 – 1.50)
Hatchery Chinook salmon	1.48 (1.42 – 1.53)	1.75 (1.69 – 1.81)

Geometric Mean Transport Ratios from Lower Granite Dam for Snake River Basin Wild and Hatchery Steelhead (2006 through 2010)

Species	T:C_0 Ratio (90% CI)	T:B Ratio (90% CI)
Wild steelhead	1.14 (1.00 – 1.33)	1.93 (1.71 – 2.18)
Hatchery steelhead	1.05 (0.93 – 1.17)	1.36 (1.21 – 1.48)

Snake River T:B Ratios

(Chart: T:B Ratio (SAR of Transport: SAR of Bypass fish) vs. years 2006–2010, showing Wild Chinook and Wild Steelhead lines.)
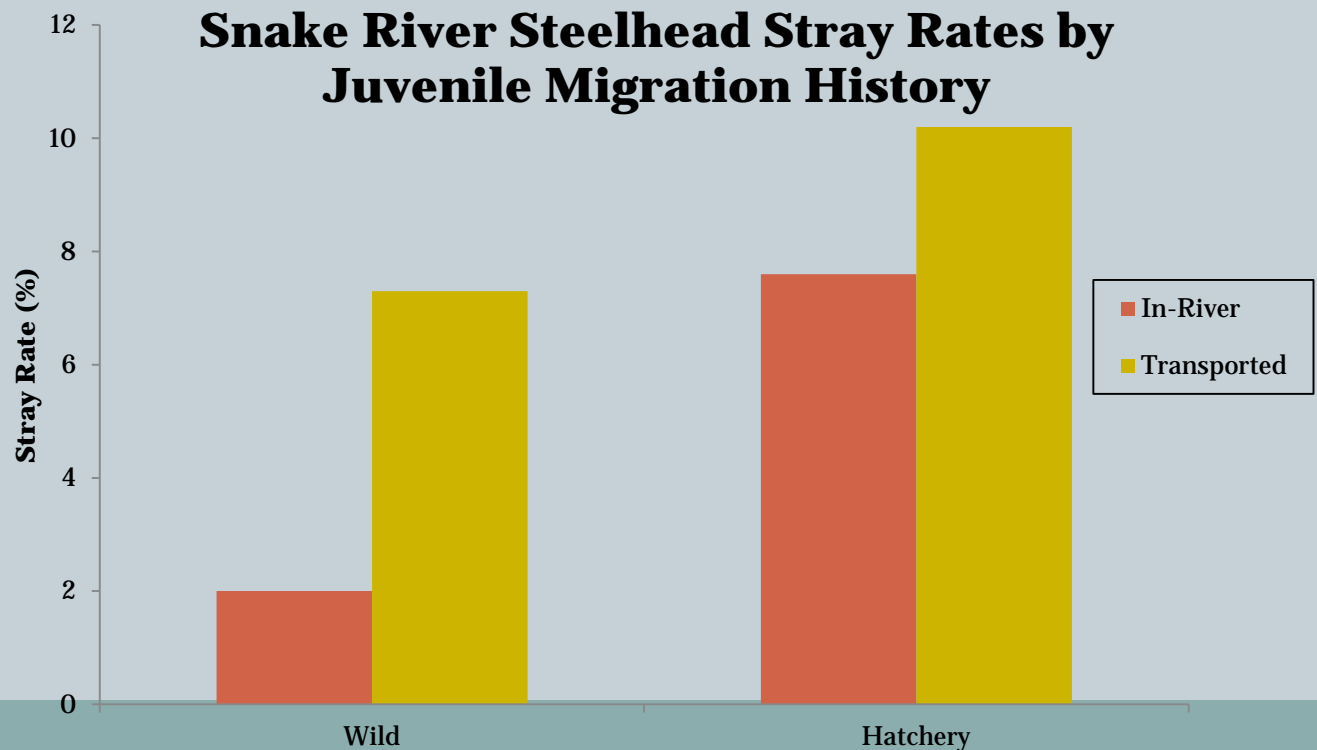
Adaptive Management

- **Research has improved this tool**
  - Timing of transport (next talk)
  - Improved facilities
  - Release locations
    - Lower Estuary
  - Environmental covariates
    - discharge
    - temperature
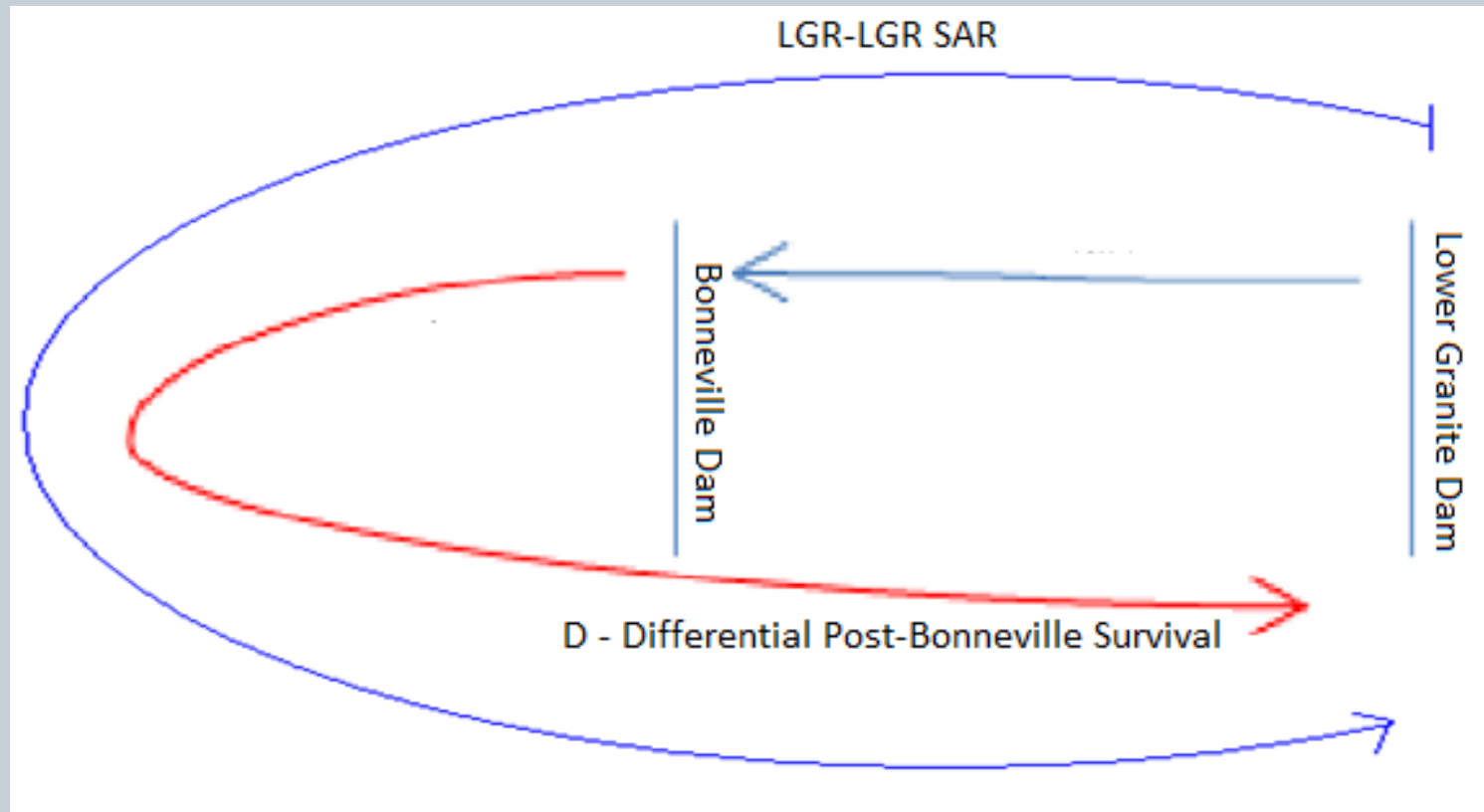 - Species specific evaluations
    - sockeye

Criticisms of the program

- ## Efficacy of the program
  - What is the standard?

- ## Unintended consequences
  - Straying

Snake River Steelhead Stray Rates by Juvenile Migration History

Stray Rate (%)

12

10

8

6

4

2

0

Wild　　　Hatchery

■ In-River
■ Transported

Criticisms of the program

- Differential Delayed Mortality

Criticisms of the program

- **Personal Aesthetics**
  - Unnatural- "Fish belong in the river."

Future of Juvenile Salmon Transportation

- Transportation continues to be an important tool to mitigate impacts of hydropower system and extreme environmental conditions

- Goal: Eliminate the survival advantage of transport through in-river improvements.
  - What if BiOp Dam passage Performance Standards are met?

QUESTIONS